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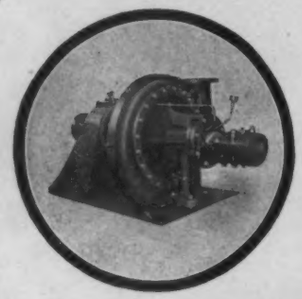

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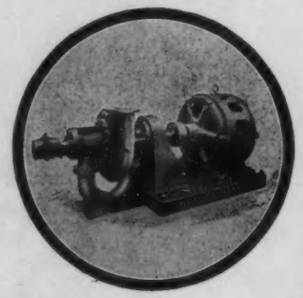

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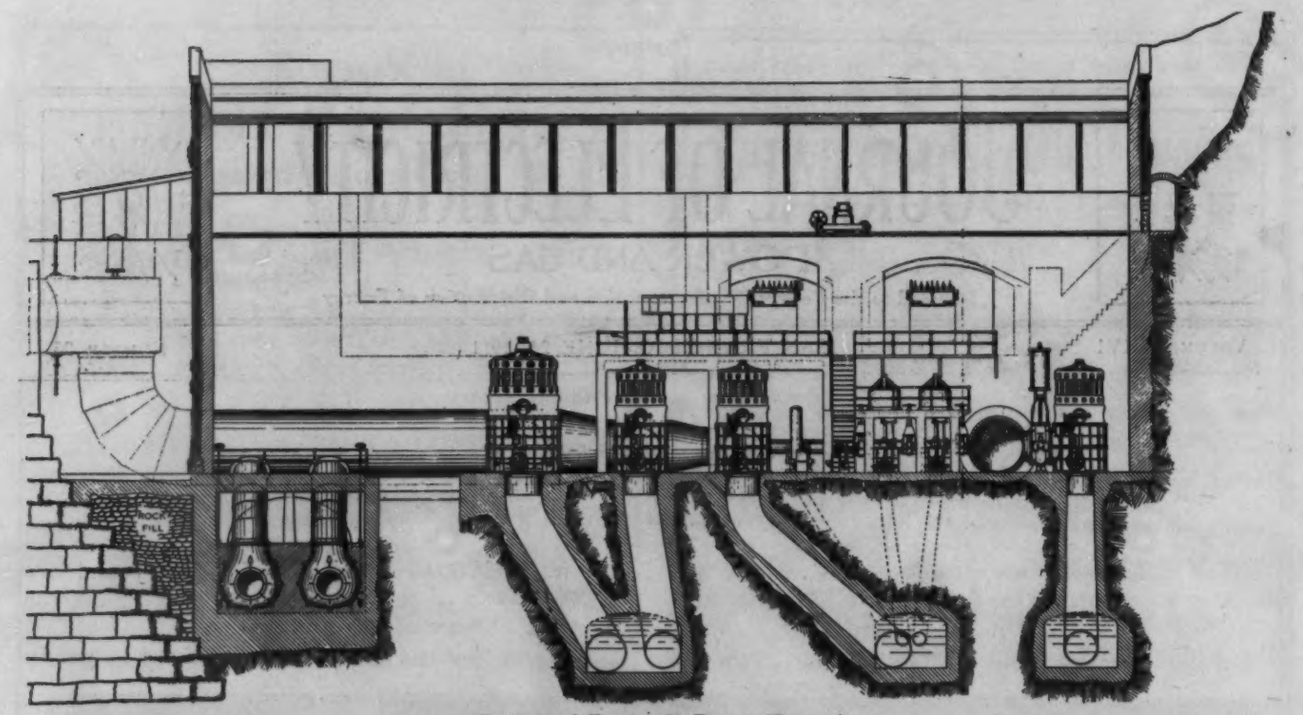
POWER AT THE ROOSEVELT DAM

BY HARRY WELCH.

The Salt River Valley Project adjacent to Phoenix, Arizona, conserves the flood waters of two streams, so as to irrigate 240,000 acres of land from a 28-mile lake impounded by the Roosevelt dam. This arch gravity structure of rubble masonry rises 284 feet from foundations sunk 30 feet in the bedrock of the river. At base the dam is 168 feet through, tapering to a width of 20 feet at the top where the length, including the two bridges crossing the spillways, totals 1080 feet, 326,000 cubic yards of masonry and over 350,000 barrels of cement were necessary in the construction.

Among the first problems, was where to get the power to lift the giant blocks of stone into place, to make and grind the cement, to run the drills, and in fact to build the dam. Nineteen miles above the dam-site a weir across the Salt River diverted to a power canal 250 second feet of water under a 226

Roosevelt Dam.

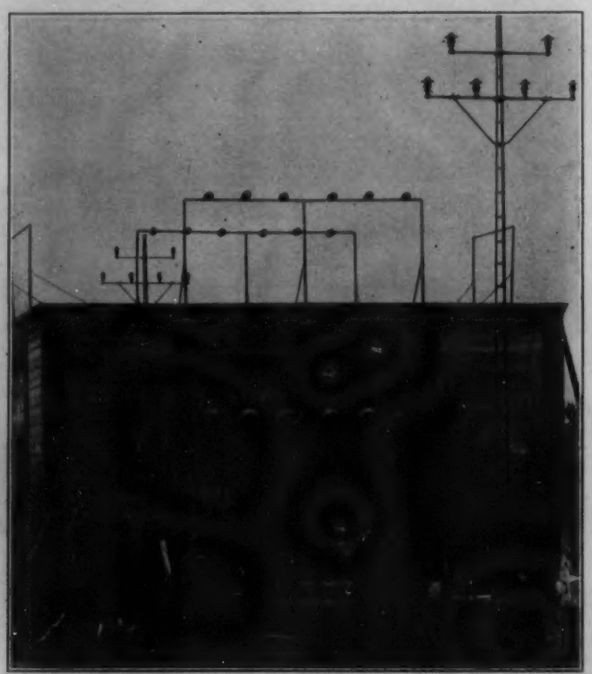


Section of Roosevelt Power House.

ft. head, through an inclined penstock tunnel, concrete and steel lined, to the three 1200 kw. vertical turbines. These operate at 500 r.p.m. furnishing three-phase, 25 cycle, 2300 volt current. Thence it was discharged into the river and allowed to continue

Vertical Turbo-Generators at Roosevelt Power House.

down stream. Here is generated the power that has built the dam and is now lighting the city of Phoenix, 75 miles away. The power is also used for street railways and commercial purposes at Phoenix as well as at Mesa, Tempe, and other Salt River Valley towns. The power generated at the dam is about 7200 kw., including three units to be operated under the reservoir head and in the entire project there will be generated when all the plans are completed, a total of about 27,000 h.p. At present the city of Phoenix consumes only about 2000 h.p., but power is transmitted to several points for pumping. At Sacaton, on the



Switching Station near Mesa, Salt River Valley.

Pima Indian Reservation, some fine batteries of wells have been established and power can here be used to lift water, for 10,000 acres of land. A number of

Sub-Station No. 2 and Well No. 8, Gila Indian Reservation, near Phoenix, Ariz.

motors are lifting water for 20,000 to 40,000 acres of land in the vicinity of Mesa, where are other large wells. In other points pumps can be installed to lower the ground water and lift drainage water to higher levels that cannot be placed under gravity ditches.

The journey of the water from the Roosevelt dam to its final distribution on the land is a story of utility. The stream passes from one power canal to another. Some of these power canals and tunnels are yet to be developed but all are included in the complete project, which is now fast acquiring the finishing touches. Seven miles from the Roosevelt dam the water will enter a short tunnel which will save 7000 feet of canal and at the same time develop 3500 h.p. The water returns to the old river bed and is uninterrupted for about twenty miles when it is directed through another tunnel 3500 ft. long, where it develops 2500 h.p. before re-entering the river below. Almost at once it is again taken up and is

Portion of Concrete Lined Power Canal at Roosevelt.

now carried along the rocky hillsides for several miles and then dropped a sheer 100 ft. through another set of wheels which will develop about 5000 h.p. The water then follows the river bed until reaching the Granite Reef Dam where it is diverted by a great weir, 1100 ft. long and 38 ft. high, to the main irrigating canals on the north and south banks of the river.

In the main canals more power will be developed. On the south side of the river, two miles from the head of the canal, one-half of the water is turned into the Consolidated canal with a drop of 30 ft. and developing about 2000 h.p. in the fall. On the north side, the main canal, the Arizona, flows without interruption for fifteen or twenty miles, to a point at which about one-half of the supply will be diverted through a new crosscut canal. This canal carries the water about four miles along the base of the rocky points to a place where there will be a drop of 126 ft., the water in the fall developing 3000 to 5000 h.p. according to the season. The other half of the water of the Arizona canal, when it reaches the Arizona falls,

Transmission Line Crossing Desert Near Salt River Valley, Arizona.

a mile or two away from the dividing point, will develop about 700 h.p. On the south side of the river there is again a further possibility of developing another 700 additional h.p. The power generated will

be sold to the ranchers in the valley at reasonable rates. Community lines from the main power lines to different sections will be established. It will be economical to operate the farm machinery with the cheap power available and there will be great quantities used for pumping in the sections of the valley that are outside of the 240,000 acres that are included in the project.

The great transmission line from Roosevelt dam to the city of Phoenix, seventy-five miles long, over mountain and desert, is splendilly equipped as are also the different power stations, pumping stations and batteries of wells. The transmission voltage is 45,000, the wires being arranged to form an equilateral triangle with 4 ft. sides.

It will be readily seen that with the great power possibilities of the project, there is in store for the farmer under this system of reclamation, a large revenue which will surely in time not only cover all annual charges for maintenance of the system, but in addition will pay him a handsome return, each year, for the money he has invested in his land. The entire scheme is inseparably associated with the ownership of the lands, and all the 240,000 acres of land that are included in the Salt River Project have a share in the concern, each acre a share and each share an acre. The Government has expended about $9,000,000 on the project to date and of this amount about $3,500,000 has been expended on the building of the Roosevelt dam. Comparing the dam with some of the famous dams built in the east it will be found that the structure at Roosevelt stores twelve times more water than the New Croton, Wachusett and Askokan reservoirs combined, while the cost of these combined reservoirs was seven times the cost of the main work in the Salt River Project. The first stone was laid on September 20, 1906, and the last stone was put in place on February 5, 1911.

The Salt River Project will not be turned over to the Water Users' Association for two years and in the meantime the Water Users' Association is arranging for the construction of the Crosscut canal, and has voted bonds for $900,000 for the purpose. The machinery has been ordered, several contracts have been let, and funds are well in hand. The Water Users' Association is the organization through which the Government deals with the farmer. Its membership is composed of the farmers and landowners whose lands are included in the project. The Government will not deal direct with the individual, but will deal only through the association. The value of the power features of the Salt River Project have been variously estimated, figuring the total horsepower at 27,000 and allowing $50 for a horsepower per year, we have a total of $1,350,000 or a net return of over $5.00 to each acre each year. Several offers have been made to the Water Users' Association for the taking over of the power features of the project but the association will develop and hold the great possibilities that are held forth in this unique scheme of reclamation and conservation. This association of farmers and landowners becomes a significant factor in the "power producing world" and undoubtedly the progress in the Salt River Valley under this system will be watched with great interest by people all over the country.

A REPLY TO COLONEL THEODORE ROOSEVELT.[1]

BY FRANK H. SHORT.

The Commonwealth Club of San Francisco, on March 27, 1911, tendered a banquet to Colonel Roosevelt. At this banquet I was invited to speak for ten minutes on "Conservation from the Point of View of the Western States." Colonel Roosevelt, as the guest of the evening, was, of course, allowed unlimited time, following all of the others. So far as the other gentlemen who spoke were concerned, he simply took sufficient time to "ditto" their remarks, and proceeded for the remainder of a full hour, in a very brilliant speech, to mutilate and obliterate my feeble remarks.

Colonel Roosevelt's reply to this argument, thus briefly outlined, was certainly brilliant, forceful and effective. We may always differ as to deduction and conclusion, but I very briefly propose to show that not only in his conclusions and his deductions, but in his statements Colonel Roosevelt, unwittingly, no doubt, preserved his consistency by being uniformly and always wrong.

It requires a philosopher to be right on general subjects, a statesman to be generally right on questions of government, but it requires a genius to be generally wrong on most subjects and still to be able to persuade people that he is right. Colonel Roosevelt is a genius.

First, I had referred to a decision of the Supreme Court of the United States, rendered some seventy-five or eighty years ago, and this decision was both seriously and jocularly assailed by Colonel Roosevelt as necessarily obsolete, entirely too ancient for modern use, and a subject fit only for jests and gibes, adroitly overlooking that portion of my remarks in which I had stated, "These decisions have been re-affirmed," etc., and have been held "to apply to the later admitted States and the lands and resources therein." All that had been decided in the first case, and all that I contended for was re-affirmed by the Supreme Court of the United States in the case of Kansas vs. Colorado, decided May 13, 1907; by the way, during the administration of President Roosevelt, and it certainly will be admitted that anything that occurred during his administration is strictly modern, not ancient and obsolete. In the case referred to, the Supreme Court of the United States used this language:

> "While arid lands are to be found mainly if not only in the western and newer States, yet the powers of the National Government within the limits of those States are the same (no greater and no less) than those within the limits of the original thirteen," etc.

The decisions of the Supreme Court of the United States related to certain property being held in trust and to certain powers of government fixed and delegated under the Constitution. Later inventions and changes in methods of commerce and mechanical devices do not transfer property, nor do they grant or extend powers, except to extend them in so far as a change in practice and custom may automatically result in bringing certain industries under a different governmental authority. Such later changes, inven-

[1]Abstracted.

tions and devices have no more to do with powers of government, and have no more connection with the rights of property, than has the invention of the aeroplane the effect of repealing the Ten Commandments.

If it is now argued that because of a change in condition and the development of values and uses not known, that a right of property held in trust, and a right of government fixed by an unamended law, is to be swept aside merely because one individual thinks it would be better for the great mass of mankind to take from the one and bestow upon the other, we cannot know but ere long we will be confronted with the argument that the Commandment "Thou shalt not steal," should be repealed, or more appropriately speaking, should be ignored, because to take from the abundance of the few for the benefit of a sufficiently large number of people (usually voters) is not stealing, but benevolent assimilation.

If conversion of trust property is commendable under a higher law, and for a greater good, who can say that it is not merely another and easy step to a repeal of any other objectionable commandment or law that interferes with the greatest good of the greatest number, in the opinion of the greatest politician of a particular generation?

Throughout Colonel Roosevelt's speech it remained undenied that if "the remaining resources of the Nation" now "belong to all of the people of the Nation," that in the beginning "all of the resources of the Nation belonged to all of the people of the Nation." Nor was it denied that East, North and South had received all of their portion of the common inheritance, nor was it denied that it is now claimed that the remaining portion of the Western States should be held for the benefit of "all of the people of the Nation." Nevertheless, a very brilliant rejoinder was made in the way of what we lawyers would call a confession and an avoidance. In fact, Colonel Roosevelt's argument was, first, to the effect that while the remaining resources of the Nation were to be held for the benefit of all of the people of the Nation, that the people within the districts where such property was situated would still receive greater benefits than ever therefrom. In other words, that all of the people, under this new system, would get all of the benefits of all of the property of the Nation, and the people of the district where it was situated would get more benefits than heretofore, which would seem to indicate that the argument is sustainable that a pint cup of water will fill a two-quart vessel, and that you can keep your cake and eat it, and have more cake when you get through than before you commenced.

Admitting, however, that the proposition really is to hold the remaining resources of the Nation for the benefit of all of the people of the Nation, and for the Federal Government through the public lands to exercise Federal authority and control throughout the Western States, such as cannot be exercised in the Eastern and other States not having public lands, nevertheless, it is asserted that while the Western States are to be shorn of their powers of taxation, of eminent domain and sovereign control over the public lands, and exceptional charges and burdens are imposed on the use thereof, that while this is "New Nationalism" and will take away these rights and functions from the Western States, still that the Federal Government, in the way of generosities and bequests, donations and family allowances, such as the Reclamation Service illustrates, has given a sufficient return.

Stated in other words, if the Western States have been deprived and are to be deprived of their sovereignty powers of taxation and eminent domain and made to submit to unequal taxation, so far as these rights are affected by the remaining public lands, that, nevertheless, it can be shown that in the taking away of this birthright, they have received a sufficient mess of pottage in return.

Obviously, the whole argument is beside the point. The rights and duties of the National Government, and of the several States, cannot be assumed by the one, or traded away by the other. The Nation has certain duties of government, and the States have certain duties of government, and each has reciprocal rights, duties and obligations and responsibilities, and the argument is hopelessly bad that these have been, or are to be, departed from, waived or exchanged for a sufficient and valuable consideration.

Conservation is appealed to as a National policy. Reclamation is claimed to be conducted on a basis peculiarly favorable to the West. However, reclamation in the West is conducted on the basis that the funds therefor must be obtained wholly from the sales of Western lands.

Appalachian Forests, however, are purchased and established, and reclamation in the East is carried on by appropriations directly from the general treasury, and not to be repaid. Upon the other hand, repayment for money advanced in Western reclamation is secured by mortgages, or liens, amounting to the same thing, upon the lands and homes of the small settler, who is thereby obligated to repay all that has been advanced, dollar for dollar. Having been born and having lived on a Western farm, and having lived all of my life amongst Western people, I apparently may not be expected to have an understanding of their needs such as arises from casual visits and political relation. Fullness of heart and deepness of affection belong apparently to those who are either doing politics or doing nothing. Therefore, my opinion that the loaning by the Federal Government of money derived from the sale of local resources for the development of the public use of irrigation in Western rivers, such liens to be repaid and secured by liens on the twenty, forty and eighty-acre farms and homes of poor settlers, is little short of extortion, must, I suppose, be read as the cold-blooded opinion of a cold-blooded corporation lawyer.

The people of the East and the North and the South have no desire or disposition to do injustice to the West. They are actuated by reasonable and generous motives. But while each section of the country can in a degree understand what pertains to the whole Union, such section can only understand those local matters that pertain to its own portion of the Union. Therefore, each section and each State should religiously hold on to, enforce and protect its own right, at the same time, with equal sincerity, re-

specting the rights of all other sections of the Union. The "parable of the four brothers" illustrates an undeniably correct situation, with equal relation to historical and present conditions, and the more it is argued against the more it will grow and the longer it will survive.

One of the most conspicuous features of Colonel Roosevelt's address was the total absence of any apparent realization that the Western States, as well as other States, possess powers of government and the powers and duties to regulate and control monopolies. As a matter of fact and of law, each and every one of the Western States, for all purposes of protecting itself and the people within the State from every kind of oppression and monopoly, has all of the powers possessed by any sovereign government in the world. Four-fifths of the States have no public lands, and, therefore, the Federal Government can act in those States only under the Constitution, and, therefore, when it acts otherwise through the public lands in the Western States, it, the Federal Government, acts not through the Constitution, but as a landlord, and arbitrarily and illegally.

Colonel Roosevelt is sincere, no doubt, in his view that the National development of irrigation benefits the people and prevents monopoly. I am not one of those who criticise the Reclamation Service; I think it has proceeded with more efficiency than is usual in connection with a politically managed business. I do not doubt its integrity, but informed persons know that many mistakes have been made that will cost the smaller settlers under the reclamation projects a great deal of money.

In every one of the Western States the development and beneficial use of water, whether for irrigation or power, is peculiarly and fully subject to the regulation and control of such State, not only as to charges, but as to service, and unless we wholly deny to the people of the Western States the capacity of self-government, no single one of these developments, no matter how large or how small the corporation may be that develops it, can ever become a monopoly in any hurtful or oppressive sense.

The true situation is that the cost to water users for equivalent uses under irrigation projects developed by the Federal Government have averaged nearly, if not quite, four times as much as the average cost for equivalent uses and benefits under what Colonel Roosevelt calls monopolies "of the very worst and most undesirable type." Further, it is true that the reclamation projects have necessarily been more expensive than the privately developed projects, but it can be fairly asserted that, the necessary cost considered and the equivalent benefits produced, the reclamation projects have been at least twice as expensive "to the poor small man" as has been the cost for similar service and values under these execrated "monopolies."

The doctrine of holding "all of the remaining resources of the Nation for all of the people of the Nation," instead of distributing the remaining property as rapidly as circumstances will permit, as far as possible to small ownerships and to actual settlers, and leaving the regulation of public uses to the State, is Socialism, pure and simple. It is the most drastic, sweeping and complete form of Socialism that could be suggested. If it had been adopted from the beginning, we would have had a "Nationalism," complete and perfect within itself, States ruled through the public lands and necessarily mere dependencies; people holding the lands as tenants or through National favor and under official surveillance.

You may call it progress, if you will, but it is progress backwards, towards the beginning of the world. It is the most Adamic, arbitrary suggestion of form of government that has been made in the last one thousand years. We are told that the government must be kept in the hands of the people. God knows we hope that it will, but how it can be so kept by the Government acting as a landlord, and through the public lands, we do not know. We choose an electoral college; the electors choose a president; the president appoints a secretary of agriculture; the secretary of agriculture appoints a forester; the forester appoints a district forester; the district forester a local forester; the local forester studies local conditions, ascertains what are and what are not monopoies, who are "malefactors," and who are good citizens, what should be taxed and what should not be taxed, what should be regulated and what should not be regulated. Then the local forester reports to the district forester; the district forester reports to the forester at Washington; the forester reports to the secretary; the secretary reports to the president; the president forgets that we have a Congress, and tells us what we ought to do, and adopts rules and regulations for our benefit and protection, and, lo and behold, government is restored to the hands of the people and the people rule! If this is not retractive progressiveness, headed straight towards the creation of the world, then I understand nothing of government, and have no knowledge of history.

We are all equally and profoundly interested in the preservation of our constitutional form of government and of our liberties and a continuance of the government in the hands of the people, in the prevention of monopolies in such a way as to not throttle industry or prevent progress. There is one way, and one way only, that this can be done, and that is by devoted, old-fashioned, patriotic adherence to our constitutional form of government, "rendering unto Caesar the things that are Caesar's, and unto God the things that are God's." To the Nation, all things that pertain to the Nation; to the States, all things that pertain to the States; to the end that this shall constitute and continue to be a real and actual govtrnment of the people, "an inseparable Union of indestructible States."

Very recently, and since the discussion before the Commonwealth Club, the United States Supreme Court, in a case appealed from Colorado, has affirmed the authority of the Federal Government, by virtue of its proprietary title to the public lands, to establish Forest Reserves and exclude trespassing stock therefrom. The decision does not go to any of the important questions discussed, but it is agreed that it does affirm the right of the Federal Government to establish, operate and protect such reserves in the public

interest, and to make rules and regulations for the full protection of its proprietary interest therein. This doctrine I have personally never controverted, and while the decision will for a time, no doubt, be widely misunderstood, it does not relate to or affect the question of the right of the Federal Government to deny to the State public uses over the public lands, such as can be acquired by eminent domain over other lands for railroads and other means of travel, telegraph and telephone lines, canals, ditches, and the like, nor does it in any manner suggest the right of the Federal Government to exercise any powers of government or control or impose any taxes or excises of an unequal or unusual nature in any State. This case and the Kansas-Colorado case, above referred to, might well be agreed to as settling the law that as a proprietor in the public interests, the Federal Government may make all needful rules, regulations and reservations that it may desire to make in connection with the public lands, but that it cannot, under the guise of such lands or through reservations made of the same, exercise any exceptional powers of government in any State; impose any exceptional or unequal taxes, or excise or other unequal charges therein; or prevent the construction of roads, railroads, telephone or telegraph lines, or canals or ditches or other public uses therein. I have constantly adhered to this view, and have always agreed as to the full authority of the Federal Government for the protection of its proprietary interest in the public lands. In any event, the Supreme Court of the United States decides the law, and it is the duty of all loyal citizens to conform thereto. I am, therefore, thankful that we are reaching a point where if extreme conservationists will assume the same attitude, where the decisions are against them, we can proceed in an orderly and well understood way in accordance with the law. It will be observed that the Supreme Court passes on no question of policy or the equities most discussed in our argument. Such questions are stated to be for Congress, not for the courts.

CHINESE TELEPHONE AND TELEGRAPH SYSTEMS.

Consul General Amos P. Wilder of Shanghai states that improvements in the telephone and telegraph systems of the Chinese Empire are being made in accordance with a program adopted by the Board of Posts and Communications. This program was arranged to cover nine years, beginning with 1908 and ending with 1916. An abstract of the program, showing the improvements yet to be made, follows:

During the present year depots will be established for experiment purposes and also for the manufacture of telegraph and telephone instruments and materials. The following additions will be made to already existing telegraph lines: In Hunan, Hunkiang and Yungchow lines; in Honan, the Chow-chia-kou and the Haochow lines in Amuri; in Manchuria, the Anhui Province lines; in Kwangtung, the Kaochow-Pi-ching lines. Plans will be made for the erection of wireless-telegraph stations along the seacoast. Experiments will be made with automatic telephones in the city of Peking. The telephone systems at Tientsin and the Provinces of Kiangsu and Chekiang will be extended and enlarged.

In 1912 the northern and southern telegraph circuits of Shensi and Shansi Provinces will be extended, as well as certain lines in Kwangtung Province from Foshan to Hsun-teh-hsiang-shan. Officers will be sent abroad to investigate foreign-made electrical materials and compare them with materials manufactured in China. Telephone and electric-lighting systems in Hupeh Province will be extended, and telephone installations in Hunan and Shantung Provinces will be experimented with.

In 1913 China will participate in the international electrical conference. Telegraph lines will be constructed from Fuchow in Kiangsi Province to Ying-chih in Fukien Province, and from Chi-an in Kiangsi to Ti-ling in Hunan. Experiments are to be made with automatic telephones at Canton, Tientsin, and Shanghai; and with telephones in Shensi and Honan Provinces.

In 1914 telegraph lines will be extended from Hsing-i in Kwei-chow to Kwangnan in Yunnan and from Chengtu to the capital of Szechwan Province and to points in Kansu Province. Further depots for the experimental manufacture of electric lighting, submarine cables, and all kinds of materials for electrical appliances will be established. Telephone systems will be tried in the Provinces of Kweichow, Yunnan, Szechwan, Kwangsi, and the systems already in operation in Shansi Province will be extended.

In 1915 extensions will be made to the lines between Pu-erh and Hsunning in Yunnan; and to the lines between Ching-yuan in Kwangsi and Kuei-yang in Kweichow. A survey will be made for a line between Urga and Kobdo, Mongolia. A depot for the manufacture of all materials used in wireless telegraphy will be enlarged. Experiments will be made with telephone systems in Kansu and the New Dominion (Hsin Chiang). Telegraph lines in both inner and outer Tibet will be extended.

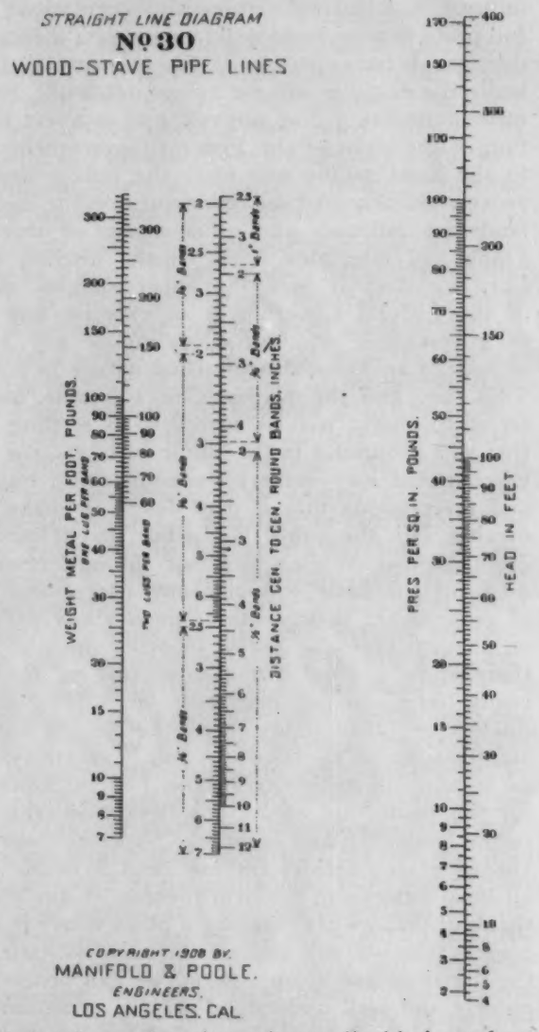
In 1916 telegraph lines in inner and outer Mongolia will be extended. Plans will be made for the construction of telegraph lines from Pao-t'eu-Chen to Ning-hsia, from Kansu to Ching-hai and inner Tibet, and from Ili to Kuche. The telegraph lines in the northwest Provinces will be reconstructed and the general improvement of all the electric-lighting plants and telephone systems in the Empire will be undertaken.

It is impossible to say how much of this program will actually be put into operation, much depending upon the funds at the disposal of the Board of Communications. Only by stationing a representative at Peking who will have access to the officials of the board will it be possible effectivly to keep in touch with the actual operations in the way of the construction and extension of telephone and telegraph lines in this Empire.

The steel motor cars used in the Alameda electrification of the Southern Pacific Company are 73 ft. long and 10 1/3 ft. wide, with 23¾ in. aisles and two and three-passenger cross-seats. They seat 116 passengers and one motor and one trailer car has a weight of 761 lb. per passenger seat.

WOOD STAVE PIPE.

The accompanying diagram, published by permission from Manifold and Poole's "Straight Line Engineering Diagram," is used for designing wood stave pipe and estimating the quantities of materials required. It is seen to consist of eight vertical scales, No. 1 gives the outside diameter of the pipe in inches, No. 2 the corresponding size and number of staves, No. 3 the weight of metal per foot with one lug per band and No. 4 with two lugs per band, No. 5 and 6 the distance from center to center for various sized round bands, No. 7 the pressure in pounds per square inch and No. 8 the corresponding head in feet. Problems are solved by connecting No. 1 and No. 8 by a straight edge and reading the required results on the intercepted scales.



Scale No. 2 shows directly the size and number of staves required. For instance, a 48 in. pipe made with staves 1½ in. thick would have an outside diameter of 51 inches and require 29 staves. As the staves are from 2x6 in. stock, 29 board ft. of lumber would be necessary per ft. of pipe.

A tensile strength of 60,000 lb. per sq. in. is assumed for the steel in the bands, with a factor of safety of 4. Swelling of the wood is assumed at 100 lb. per sq. in.

Example. A 48 in. wood stave pipe has an outside diameter of 51 in., find the distance between center of ⅝ in. bands to sustain a head of 48 ft., also the weight of metal in bands and shoes per foot of pipe.

Solution. Connect 51 on Scale No. 1 to 48 on Scale No. 8 and read 5.9 in., on Scale No. 5, the distance from center to center, and 36 lb. on scale No. 3. If the bands were of 1½ round, the distance from center to center would be 3.8 in. as found on Scale No. 6.

The following information on the characteristics of wood stave pipe, its use and cost is abstracted from a paper presented by T. C. Hatton at the annual convention of the American Water Works Association, June 5-9, 1911:

There are two distinct forms of wood stave pipe in common use. One is termed "continuous" and the other "machine made." Both are built of the same character of wood, and the staves are of equal thickness for like pressures. Those built into "continuous" pipe are made of uniform thickness throughout their lengths, with a bead on one longitudinal edge and with a saw kerf at each transverse edge into which a metal plate is inserted to make a water tight joint. The bead on the longitudinal edge serves to make a water tight joint by being squeezed into the face of its neighboring stave when the iron bands surrounding the pipe are cinched up. The staves are made in unequal lengths to enable joints to be broken in constructing the pipe. The staves are held together by round iron or steel bands of such diameters and spacing as will retain the pressures required, each end of the bands passing through a malleable iron shoe and having a thread to which a nut is fitted. Thus the staves can be brought together so close that no leakage can occur unless it oozes through the grain of the wood.

This form of wood pipe is built in the trench, and from 16 ins. to any diameter required, but is more commonly used for pipes over 24 ins. in diameter. It has one special feature well worth noting, if the pipe leaks at any point in the longitudinal joints, these leaks can be easily stopped by cinching up the bands near the leaks or if some defect shows up in the pipe line a few years after building, sections can be easily removed and replaced, by substituting new staves, or new bands.

The staves built into "machine made" wood pipe have two beads upon one longitudinal edge and two corresponding grooves in the other longitudinal edge. The beads are a little larger than the grooves, thus insuring their being totally filled and made water tight. At one end there is a tenon, cut 4 ins. long, where the staves are one-half the thickness of the balance of the walls of the pipe. On the other end there is a chamber cut 4 ins. deep. The tenon is smaller in diameter at the end than at the shoulder and when driven into the chamber makes a water tight joint, even though the two shoulders are not in perfect contact.

The staves are cut radially to correspond with the diameter of the pipe, and are held together by a steel band, steel wire or copper clad wire. This band or wire is wound spirally upon the pipe by a machine. The high tension produced by the machine squeezes the beads into the grooves making a longitudinal joint that cannot leak so long as the elastic limit of the band is not overcome.

Where steel is used for banding the pipe it is run through a bath of warm asphalt, which adheres to its surface, thus protecting it from any water which might ooze through the grains of the wood. After the pipe is wound, and the tenon and chamber cut, it is rolled in a bath of hot asphalt which adheres to the outside of the steel and wood protecting them from outside oxidizing agents. It is then rolled in a bed of sawdust. This sawdust enters into the asphalt and forms a protection for it in shipment and handling.

"Machine made" wood pipe are made in lengths from 5 to 12 ft. and shipped to the work ready to be laid. They are laid by driving one piece into another until the two shoulders are in contact, or nearly so. No skilled labor is required; the inspector standing on top of the trench can readily observe whether the pipe has been driven home by observing the two shoulders. This form of pipe is made for diameters from 3 ins. to 36 ins. Either form can be laid around curves of from 90 to 200 ft. radius, according to the diameter of the pipe.

One of the usual questions asked is, "What pressure can wood stave pipe safely withstand?" The proper reply to this is that the tensile strength of the material composing the bands represents the pressure the pipe will stand. Wood pipes are made to withstand pressures up to 200 lbs. per sq. in., so far as the writer knows. The more the pressure under which the pipes are subjected, the more steel or wire is required to band them together.

As the tensile strength and elastic limit of iron and steel are well known, it becomes a simple matter of computation to determine the gage and spacing of the bands to make a wood pipe which will withstand any pressure up to 200 lbs. Beyond this pressure it is likely the water would waste through the pores of the wood so that a higher pressure would not be economical or practicable.

The writer has experimented with wood pipe up to a direct pumping pressure of 300 lbs., without fracturing the pipe. This experiment was made to ascertain what a pipe built for pressures up to 100 lbs. would do if it was subjected to a water hammer equal to three times the pressure. At 250 lbs. the water oozed through the walls of the pipe. At 300 lbs. it spurted in small streams at a few of the longitudinal joints, with a few leaks at the transverse joints. The pressure was suddenly removed to nothing, and gradually brought up to 100 lbs. with the result that the leaks stopped. This showed that, while the steel bands had been stretched, the elastic limit had not been overcome, and the pipe would, under such conditions as frequently exist in a long pipe line, safely withstand a wide range of pressures suddenly applied.

Pressures from 100 to 150 lbs. are common in machine made wood pipe, while continuous pipe of large diameter is successfully operating under pressures from 80 to 130 lbs.

Assuming that wood stave pipe is laid where it will be constantly subjected to water pressure the life of such is entirely dependent upon the life of the material with which it is banded. While the life is somewhat problematical there are well known illustrations where steel banded pipe has been in continuous operation for 50 years without apparent deterioration. While the writer has industriously made inquiries wherever such might be expected to give reliable information he has failed to learn of a single case where steel bands have given way on machine made pipe.

The engineer who designs a continuous wood stave pipe provides for at least a factor of safety of 3 in determining the size and spacing of his bands. The manufacture of machine made pipe provides for an equal factor of safety. Now when steel or iron corrodes it does so by pitting, and thus it is reasonable to assume that two-thirds of the cross-section of the steel can oxidize before the band will fail under ordinary conditions. From the writer's observation sheet steel, such as composes the bands of machine made wood pipe, pits in irregular spots, and never on a straight line, thus the band may be two-thirds gone before the pipe will fail.

Where oxidizing agents are known to exist, such as in salt marshes, through salt water or sulphur deposits, the pipe should be banded together with copper clad steel wire. This copper clad wire is cheaper than solid copper wire. It has an elastic limit of about 50,000 lbs. per sq. in., a tensile strength of from 90,000 to 100,000 lbs., and a coefficient of expansion less than two-thirds that of copper. Thus it becomes a product equal in strength with the steel and far better than copper. The writer knows of several cases where copper clad steel wire wound wood stave pipe has been successfully used where cast iron and steel pipe were unsuccessful.

The claim is made by wood pipe manufacturers that wood pipe has a greater carrying capacity than cast iron pipe of equal diameter, and from a few well conducted experiments this claim seems reasonable. Marx, Wing and Hoskins of Stanford University conducted careful experiments to determine the coefficient of friction in wood pipes. They found that coefficient n amounted to .009. Mr. Campbell on the El Paso and Southwestern Railway pipe line, found the value of n in 13,200 ft. of 10 in. wood pipe to be .00866, and in 47,500 ft. of 16 in. wood pipe to be .0092. Mr. Campbell had exceptional facilities for determining the true values of n which are rarely found in actual practice.

The value of n in new cast iron pipe has been determined repeatedly and found to be .012. From the results of these experiments it appears quite true that a wood pipe has greater capacity than cast iron of like diameter. For instance a 12 in. wood pipe with a loss of head of 8.85 ft. per 1000 will carry approximately 2025 gals. per minute, whereas a new 12 in. cast iron pipe under the same loss of head will carry about 1810 gals. per minute. A 30 in. wood pipe under

a loss of head of 2.05 ft. per 1000 will carry about 11,600 gals. per minute, whereas a 30 in. cast iron pipe under the same head will carry about 8810 gals. per minute. The longer the cast iron pipe is used the less its carrying capacity, under frequent conditions. The capacity of wood pipe does not diminish with age, the inside perimeter becoming smoother from use.

So far as the writer's knowledge goes there have been very few well conducted observations made of the leakage from wood pipe lines. From general observations made by the writer of lines in operation, no leaks of any significance have been apparent. Mr. Campbell, however, conducted careful observations on his lines, and states that, after two years, there was no material leakage in the 10 miles of 10 in. and 16 in. wood pipe line between the source of supply and the reservoir, which pipe was working under a maximum pressure of 130 lbs. That in the 12.6 miles of 11 in. and 12 in. pipe lines below the reservoir, and subjected to a less pressure, the 11 in. line leaked 17.046 gals. per mile and the 12 in. about 3.702 gals. per mile. Along the railway, when the maximum pressure was 130 lbs. the 11 in. pipe leaked 120 gals. per mile, and 8½ in. and 7½ in. pipe leaked 268 gals. per mile. It occurs to the writer's mind that if there were 103.4 miles of wood pipe in this installation wherein the maximum leakage was 268 gals. per mile, and 8.6 miles wherein the leakage amounted to 17.046 gals. per mile, there must have been some defective joints or pipes in the latter section which needed looking after, that if 90 per cent of the whole line was practically water tight, the other 10 per cent could easily be made so. However, from the result of the careful observations made by Mr. Campbell, it seems reasonable to assume that wood pipe, properly made and laid, can be made water tight under a pressure of at least 130 lbs.

This subject may be concluded by considering the difference in cost in installing wood stave and cast iron pipe. This difference is made up of several items, as, for instance: the cost of the two characters of pipe delivered f.o.b. cars at nearest railway point. Hauling pipe alongside of trench, width and depth of trench. Laying pipe, etc.

The difference in cost of furnishing and delivering the two characters of pipe at railway points is largely dependent upon the difference in diameters of the pipes to be used. The larger the diameter the greater the difference. The difference in weights per foot of pipe also increases in direct ratio to the increase in diameters. Therefore the cost of transporting wood pipe from railway to trench is from one-third, for wood pipe 8 ins. in diameter, to one-sixth, for wood pipe 30 ins. in diameter of the cost of transporting cast iron. To overcome frost conditions the wood pipe need not be built as deep as cast iron pipe, as wood is a good nonconductor and can be laid closer to the surface of the ground without being damaged by frost. In laying wood pipe no bell holes are necessary, and this item of cost is eliminated, which, in rock excavations, becomes a very important item. As there is no lead and hemp used in laying wood pipe these items of cost are eliminated, as is the cost of melting lead, transporting and furnishing fuel, and caulking joints.

While it is impossible to compile a table showing the difference of cost between furnishing and laying the two characters of pipe which will fit conditions existing generally, it can easily be determined at a glance that there is a difference in favor of wood pipe; that this difference depends upon the size of the pipe, and that it can easily be determined for each locality when freight and labor charges are known.

A few instances of known costs might be interesting. The 23 miles of 30 in. continuous wood stave pipe laid for supplying Lynchburg, Va., with water, under the direction of Mr. James H. Fuertes, M. Am. Soc. C. E., cost, for furnishing and laying pipe, exclusive of trenching and backfilling, from $1.82 to $2.10 per lin. ft., depending upon spacing of bands. This wood was shipped from the Pacific Coast at a freight rate approximately $300 per car.

The 42 in. continuous wood stave pipe laid as a supply main for the Atlantic City Water Works, under the direction of Mr. Kenneth Allen, M. Am. Soc. C. E., cost, exclusive of trenching and backfilling, $2.25 per lin. ft.

The 24 in. machine made pipe line laid under the direction of the writer for Carney's Point, N. J., cost, exclusive of trenching and backfilling, $1.32 per lin. ft.

Comparing the above costs with the cost of cast iron pipe of equal diameter, delivered f.o.b. cars at railway point, and the cost of lead and hemp for making joints, omitting transportation charges from railway to trench, laying charges, extra excavation for bell holes, fuel for lead melting, caulking and handling cast iron pipes:

The 42 in. cast iron pipe would cost at $22 per ton	$6.11
The 30 in. cast iron pipe would cost at $22 per ton	3.47
The 24 in. cast iron pipe would cost at $22 per ton	2.43

The difference in cost of laying wood and cast iron pipe including trenching and backfilling, and under exactly the same conditions, is well set forth in Mr. Campbell's paper above referred to.

He states that the 384,300 ft. of wood pipe from 11 to 3½ in. in diameter were laid at an average cost of $0.0472 per lin. ft., whereas the 101,200 ft. of 12 in. cast iron pipe, including lead and hemp, were laid at an average cost of $0.2343 per lin. ft.

It is not the writer's purpose to recommend to his colleague, who may be interested in laying supply mains for water works, wood stave pipe under all conditions, but to suggest that, after knowing the conditions, he look into the advisability of using wood stave pipe, study its applicability to the existing conditions, including the comparative cost with cast iron or steel pipe, keeping his mind open to recommending the installation which will best suit the conditions, and he will find many circumstances when he can save his client's money and secure for him equal service.

Wood stave pipe has long been familiar to western engineers and water works superintendents. The great cost of transporting cast iron pipes from the East was prohibitory and engineers were forced to use wood pipe. These, however, have proven so efficient after many years' trial that they are being used wherever conditions are proper.

VALUATION DEFINITIONS.[1]

BY HENRY FLOY.

Depreciation, like perpetual motion, implies constant action; but only in this are they alike, for as the practitioner knows, depreciation is an inexorable reality while perpetual motion is but an alluring chimera. Webster defines "Depreciation" as the "act or state of lessening the worth of," and in this sense it will be used by the writer regardless of the source or method of worth reduction, or by what means it may or may not be removed. The term "amortization" has been used somewhat indiscriminately for depreciation, but it should properly be applied only to the laying aside of funds at a uniform rate for the ultimate replacement of capital investment; and in this sense alone will be used by the author.

Depreciation has been used to mean:

1. The annual amount expressed, as a percentage or in dollars, that should be laid aside to renew or replace the article in question at the time of its abandonment. In this use of the term, the loss of worth, which can be made good or replaced through ordinary maintenance or repairs, is not included as a part of depreciation, but is provided as a part of the regular operating expenses. This, until comparatively recently, was the more common use of the term depreciation which was applied particularly to renewals and replacements. Used in this sense, the term "depreciation" is somewhat academic and theoretical, and may or may not represent any actual financial outlay.

2. The annual amount expressed, as a percentage or in dollars, that should be laid aside to renew or replace the article in question at the time of its abandonment, plus the annual expense of maintenance and repair expended in removing such part of depreciation as is practicable and good economy. This then includes all classes of "lessening of worth" and is the application of the term preferred by the writer and used by the New York Public Service Commissions in their rules for uniform accounting.

3. The total amount—it may be the sum of several years of depreciation—expressed in a percentage or in dollars, that must be deducted from the "original cost" or the "cost to reproduce new" in order to obtain the present value. The determination of the amount of depreciation at a given time, in connection with the valuation of a property, is merely the summation of the annual accrued amounts of deterioration, which, from the time of installation, have been continuously reducing the worth of the property, less such value as has been restored by expenditures for wear and tear, replacements and renewals.

Physical Value. This expression is usually recognized to represent those elements of cost incurred in installing and putting the physical property in a condition to begin operation. It includes primarily, "those things which are visible and tangible, capable of being inventoried"; but secondarily, certain non-physical charges "which are an inseparable part of the cost of construction but which do not appear in the inventory of the completed property." These secondary values which are to be included as a part of the physical property are expenditures for such items as:

1. Engineers' and architects' fees, including cost of design and testing all construction and equipment, etc.

2. Administration expenses chargeable to construction, including superintendence, inspection, accounting, salaries of officers and clerks, consents of authorities and property owners for temporary work of use, legal expenses, rent, printing, storeroom expenses, etc.

3. Provision for various incidentals and contingencies, incomplete inventories, unforseen requirements, etc., which practical experience has shown to be necessary.

Development Expenses, Intangible or Overhead Values. Any one of these terms is generally used to include certain expenses, which, while a necessary part of the complete cost of a going property, are not costs inherently a part of the construction of the physical property, as such.

Development expenses generally cover most or all of the following expenditures:

1. Legal and other expenses of preliminary promotion, incorporation and organization, procuring consents of property owners, condemnation proceedings, obtaining franchises, consents and certificates from Public Service Corporations and other public bodies, title examinations and insurance.

2. Technical expenses in connection with preliminary work, surveys, expert estimates, etc.

3. Interest on capital and bond issues, wages of superintendence and administration not chargeable to construction ordinarily necessary in connection with putting a property in going order; and also sometimes the deficiency in operating expenses and taxes until the property is put on a paying basis.

4. Taxes of various amounts including corporation tax, mortgage tax, real estate tax, personal property tax, capital and State tax, franchise tax, etc., which must be provided and paid until the property is completely a "going concern."

5. Discounts on securities, brokerage or other customary and necessary expenditures in connection with financing such an undertaking and marketing securities.

6. Reasonable promotion profit, possibly also compensation for risk of capital, estimated at 5 to 10 per cent of the cash investment.

Development expenses are not ordinarily depreciated in the same way as the physical property, though some authorities have indicated such procedure is proper. Development expenses may well be amortized, but the rate of such amortization has no necessary connection with the rate of depreciation of the physical property. The rate of amortization of development expenses might well be based on the life of the securities, for example, 50 years, whereas the depreciation of the physical property would have to be based on its rate of deterioration through life, which the Wisconsin Commission reports to average for electric lighting properties, 17.46 years, tele-

[1]Extracts from paper to be presented at 28th Annual Convention A. I. E. E., Chicago, June 26, 1911.

phone plants 11.24 years, and electric railways, 18.02 years.

Original Cost. As the term indicates, this refers to the actual amount of money paid for the physical property including original construction plus all additions since that time. Original cost should be shown in the books of corporations, but is not always there obtainable. In making deduction for depreciation all authorities agree that the value of any property that has been abandoned or discarded should be entirely written off, unless possibly the earnings have been so small as to preclude doing so at once without unfairness to the stockholders or bankruptcy to the corporation.

Cost to Reproduce New, or Cost of Reproduction. These terms, so much in evidence nowadays, refer to an estimated value based on the cost of reproducing the physical property new, on the basis of prices current at the time of estimate—prices that fluctuate considerably are averaged for five years preceding—and is made up to include everything that can be inventoried regardless of original cost, age, service value or present condition as effected by depreciation.

Scrap Value. All physical property unless offset in whole or in part by cost of removal, has a certain scrap or junk value beyond which there is no depreciation, hence physical property can only deteriorate until it reaches its scrap value. This value is simply the fair market price that a purchaser will pay for the property in its disintegrated condition. If a property consisting of its several elements is usable not as junk but as serviceable property elsewhere, a higher price than scrap value is obtainable, and this worth has been characterized as "salvage value" or "minimum going value."

Wearing Value. If from the cost—taken on whatever basis is determined to be the correct one—there is subtracted "scrap" or "salvage" value of given physical property, the remainder is a value known as "wearing value," which will deteriorate more or less rapidly and entirely pass away, as regards the installation being considered, at the expired life of said property, which life ceases through age, inadequacy, obsolescence or sudden damage.

Service Value. Physical property, honestly and intelligently purchased with a view to its suitableness for the service intended, aside from some hidden defect or untoward accident, maintains its original value practically throughout its life except for such deterioration as results from wear and tear or deferred maintenance. The life of the property may expire normally through age or prematurely through inadequacy or obsolescence but these two latter classes of depreciation develop quickly so that for the larger part of the time used, the service value of property will approximate original cost. Service value must not be confounded with going value. Service value results from the use of the property in the place and for the purpose for which it was intended. Going value may or may not accrue in addition to, and, over-and-above service value. Going value relates to establishment of earnings while service value exists regardless of earnings.

Present Value. This expression refers to the estimated worth of the physical property as it exists at the period being considered. It may have one of several values, some purely academic and artificial as explained more fully hereafter, depending on what application is made of the theory of depreciation and therefore, present value always needs some qualification or explanation as to the sense in which the term is used. The more frequent application of the term is to that value obtained by deducting from "original cost" or "cost to reproduce new," the accrued depreciation, which may be either absolute depreciation or the sum of both absolute and theoretical depreciation. Though usually so, "present value" does not necessarily include a deduction from cost to cover deterioration as is illustrated in the valuation of the Texas Railroads made by the Commission of that State, where no deduction from cost of reproduction was made on account of existing wear and tear or normal deterioration.

Appreciation as well as depreciation must be considered in determining "present value" as indicated by the Supreme Court.

"Original cost" or "cost of reproduction new," in connection with depreciation of the physical property inventoried is quite generally used in determining present value.

In estimating "present value" it is perhaps unnecessary to state that "second hand," "scrap" or "forced sale" values are not the "fair values" to be considered in connection with a "going concern." This has been repeatedly affirmed by the courts.

In obtaining the depreciated value of "used or useful" property, worn out or replaced inventoried material which has no value except for sale, may be put in at scrap or salvage value, unless such property is being carried merely to artificially increase value.

Going Value. This refers to an estimated worth recognized by the highest courts and ingeniously figured and allowed for by at least one State Commission in connection with a wise expenditure made in increasing the business of an established plant.

Good Will. A monopoly, as is generally admitted, has no good will which can be evaluated, and the courts have sustained this view. Good will can only result where competition exists and the tendency of the times is to make no allowance for this element in a public utility valuation; it being considered that good will belongs rather to industrial enterprises where its value is determined by the profitableness of the business; namely, capitalizing the net income. Good will has no value which must be considered in dealing with the subject of Depreciation.

Franchises. As the term indicates, it is the right to "do business." Formerly franchises were considered more or less valuable assets and in some instances, have been recognized and allowed for by the courts; but the present tendency, largely by reason of legislative enactments, is to prohibit the capitalization of franchises beyond the absolute expenditures made in good faith in obtaining said franchises. Depreciation of franchises depends on their terms and has no relation to deterioration of the physical property although the expiration of a franchise might easily reduce service value.

THE WESTINGHOUSE ANNUAL REPORT.

The report of the Westinghouse Electric & Mfg. Company to be presented at the annual meeting on July 26, 1911, shows gross earnings of $38,119,112, and net income of $4,881,106 for the year ending March 31, 1911, the largest in the history of the company. The gross earnings exceeded those of the preceding fiscal year by nearly nine million dollars and were over five million dollars greater than the earnings of the best preceding year.

As these results were reached during a period of less than normal activity in other lines of industry, they afford sound basis for continued hope in the future of the electrical manufacturing industry. However, the volume of business now offering is on a diminishing scale, and the results of the last year, are no certain indication of a continuance for the future of gross earnings and net profits such as the past twelve months have produced. The business taken by the company during February and March, 1911—the last two months of the fiscal year covered by this report—was somewhat less than that taken during the same months of 1910, and the value of the orders booked since the close of the fiscal year does not compare favorably with that of the corresponding period a year ago. The value of unfilled orders as of March 31, 1910, was $11,256,196; as of March 31, 1911, this value stood at $7,616,058.

The fifteen-year agreement with the General Electric Company whereby each company licensed the other under the patents controlled by it expired by limitation of time on April 30, 1911. No renewal of it is contemplated. Other patent license agreements with manufacturers of mining locomotives, small motors, fuses, switches and sockets, under which the company has been working for some years, have recently been cancelled on the suggestion that they might be questioned as being in violation of the Federal anti-trust laws.

Considerable increase has been made in the expenditures of the selling organization, for increasing the number of salesmen in the field, for remuneration to its representatives adequate to secure the best effort on their part, for the extension of advertising, and to provide for proper warehouse facilities for carrying stocks at distributing points.

Large expenditures have been authorized for the work of new development and for improvement in current types of apparatus. This work has been particularly marked with respect to the redesigning of direct current motors, alternating current and direct current mill and crane motors, small power motors, high speed turbo-generators, circuit breakers, railway equipment and heating and cooking apparatus.

The company was made party defendant, together with the General Electric Company, the National Lamp Company and a number of other lamp manufacturers, to a bill in equity recently filed by the United States under the provisions of the Sherman anti-trust law. This bill proceeds on the theory that certain agreements and acts of the lamp manufacturers, defendants in the suit, constitute a combination in restraint of trade. The directors say that the company's operations have been such that the outcome of the suit is not likely to seriously affect the conduct of its lamp business.

The securities of the Westinghouse Electric & Manufacturing Company carried at their face values are as follows: Capital stock (assenting) $1,507,048; convertible sinking fund bonds, $266,000; bond scrip, $1,150.50; total, $1,774,198.50.

The assenting capital stock was acquired partly by the several subsidiary companies in settlement of accounts due them by the Westinghouse Electric & Manufacturing Company at the time of the receivership, and partly in settlement of disputed relations existing at and after the receivership between the Westinghouse Electric & Manufacturing Company and Security Investment Company. The stock is carried as an investment with the intent that at a favorable time it shall be resold.

The convertible sinking fund bonds have been acquired and are held in anticipation of sinking fund requirements. The bond scrip represents scrip purchased to be exchanged for bonds, also to be held for sinking fund purposes.

The following are known as the "Subsidiary Companies" of Westinghouse Electric & Manufacturing Company: Westinghouse Lamp Company, The Bryant Electric Company (The Perkins Electric Switch Manufacturing Co.), R. D. Nuttall Company, Westinghouse Electric & Manufacturing Company of Texas.

The operations of the British company have been "quite uniformly unprofitable." The French company has been "steadily unprofitable," but the Italian company has succeeded in making some money for its parent corporation. On the contract for the electrification of the St. Petersburg tramways, the company lost over a million, and had much trouble with the authorities, who seized its private papers and otherwise molested the local officers. Up to date Russian propositions have cost the Westinghouse people more than $1,800,000. Disputes over fines imposed by St. Petersburg on the company are still being waged in the Russian courts. In Austria the company has been "measurably" successful in its operations. The Canadian organization has also done well.

The total book value of power-company securities carried is $211,498.24. The total book value of all investments is given as $24,034,635.99. "The ownership of the securities of power companies constitutes the sole foundation in fact for the statements from time to time appearing in current periodicals and Government reports of the connection of the Westinghouse Company with a so-called 'waterpower trust.'"

Chairman Robert Mather concludes his report by stating: "After a careful consideration of all of the circumstances, having due regard for the true condition of your balance sheet, hereinbefore minutely described to you, the elements of uncertainty as to the immediate future of your company's business, the need for cash for new foundry facilities, for extension of the Newark plant and other factory improvements, and the necessity of making wise provision for shortly maturing obligations, your directors have felt that it is not wise at the present time to weaken your company position by diverting its surplus earnings, even in part, to the payment of dividends on the assenting stock."

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Publishers' Announcement

We take pleasure in announcing that on July 1 Robert Sibley of Missoula, Montana, will assume the position of editor-in-chief of the Journal of Electricity, Power and Gas. To this task he brings a wide experience as an operating and consulting engineer, the technical knowledge of a university professor and early training as an editor.

A Southerner by birth, Mr. Sibley is a Westerner by adoption. Preparing at the Los Angeles High School, he graduated from the College of Mechanics of the University of California in 1903. Here he founded and was first editor of the California Journal of Technology. Gaining the highest honors from both the student body and the faculty, he was called as professor of mechanical engineering at the University of Montana after serving for a brief time as electrical engineer in charge of the Mariposa Commercial and Mining Company's hydroelectric installation. At the University of Montana he was soon made professor of electrical engineering also, being dean of the school of engineering for two years prior to his resignation in 1907.

For the past four years he has been practicing as a consulting engineer at Missoula for many power and irrigation projects in the Bitter Root Valley and Western Montana. He carried on a series of investigations for the Bunker Hill & Sullivan mine, the Federal Mining Company, the Hercules and Hecla mine and was called as an expert in the damage suits of the Chicago, Milwaukee & Puget Sound Railroad of Montana. He is a member of the American Institute of Electrical Engineers and the author of many articles in the technical press.

Corporation Breaking

Federal prosecution of the great corporations is now so active as to lead many to believe that the law intends to destroy this convenient means of conducting business. Perhaps some of them will be abolished, just as an unusually high-spirited horse is sometimes killed while being subjected to a similar breaking process. But the great majority of corporations will thereby merely be made amenable to discipline, "broke to ride and drive," and become of even greater utility in the social structure. No better commercial vehicle has yet been devised to replace the corporation, as the automobile is being substituted for the horse, and until such is found the corporations should be allowed to continue.

Human progress has ever been based on a process of taming wild forces, first by might, later by reason. The first to be subjugated were the ox, the ass and the horse; then fire was made a servant, the water-fall was mastered, the wind was subdued, steam was confined, and finally the lightning was restrained. Titanic Nature, who once struck fear to the heart of man, is now constrained to do his will, namely, to provide means of getting closer together.

Every day men are getting closer together by railroad, by telegraph and by telephone. Is it any wonder that business has similarly been centralized in obedience to this primitive gregarious instinct? How futile it is to make laws "to prevent business from getting together" when each new conquest of Nature lowers the barriers of time and distance which tend to keep men apart. Yet the legislators persist in trying to build an impenetrable wall to stop the irresistible ball propelled by scientific progress.

Without electricity, the modern corporation would be impossible. As recently stated by George W. Perkins, "a corporation is a composite of steam, electricity and men." We do not dispense with the action of steam, of electricity or of men because, unregulated, they are capable of harm. Individually, they may be so supervised and controlled as to be made useful. Why not collectively?

Wood Stave Pipe

Wood stave pipe is in successful use throughout all the Pacific Coast States where the service has been unusually severe, either from climatic extremes, heavy pressures or unfavorable ground conditions. Wood has been extensively employed for underground closed water conduits in the United States since the founding of this government, although the built-up variety is comparatively new, especially in large sizes. The increase in size and output of hydraulic power systems, whose water must be carried under pressure, made it popular wherever the cost of iron and steel was prohibitive or where these materials could not be easily obtained.

Wood-stave pipe while of doubtful permanency, has a lower friction factor and offers greater resistance to collapse. Steel of an economic thickness for the upper end of a long pipe, where the hydrostatic head is less than one hundred feet, is so thin as to be liable to collapse. Cast-iron, while thicker, is more costly. The durability of steel varies greatly with locality, in some places "rusting out" in a few years. Cast-iron pipe constantly filled with pure water has long life at any point. It is interesting to note, however, that the early Californian hydraulic miners would not buy riveted pipe constructed of steel plates, but insisted upon wrought iron as having longer life. These pipes were carelessly handled, seldom buried in trenches and were as often empty as full. Yet after forty years they may still be found either in service or capable of withstanding the pressures for which they were built. However, they were seldom over twenty-four inches in diameter and exhibited a disconcerting tendency to collapse. The firm belief in these old metal pipes and a natural fear of wood decay created an early prejudice against its use sometimes apparent to this day.

Another relic of early mining practice is the open timber flume. With timber at hand and a service not injured by occasional interruption, this was the cheapest and most logical method of carrying water in the hills. Its rapid depreciation makes it inadequate for modern power supply except under unusual conditions or with a small quantity of water. Such objection does not apply to wood-stave pipe, which is closed and under pressure and thus subject to the preserving action of constant immersion. The greatest possible external pressure which may cause collapse is that of the atmosphere, which all but the lightest wood stave pipe can readily resist.

For carrying mater on canal grades, this form of pipe costs little more than either open canal or timber flume; it has a lower friction factor and prevents the loss from evaporation.

It is significant that many large stave pipes have been in continuous power plant service for ten years or more, and, with very little repair, give every evidence that another ten years will find them still in service. Care in the selection of the wood for staves, straight grain, free from knots and properly dried, is essential, redwood here being better than pine or spruce. Failures in these pipes have probably been due to either improper design or the careless selection of materials.

As the pressure is increased, the amount of steel necessary in the bands holding the staves in place, increases in direct ratio. These are calculated for strength in the same manner as is steel pipe, and therefore a point is reached where the cost of the wood pipe equals that of steel. At this point the comparative values are in favor of the steel and in fact the limiting pressure should occur some time before that point is reached. A further limitation is the pressure at which the pores of the wood do not offer sufficient resistance and sweating or actual leakage occurs.

As an example may be cited a 3000 ft. pipe line supplying water to a modern power plant. Two-thirds its length, beginning from the intake end, lies on an even grade and is straight; the maximum hydrostatic head on this section is about 100 ft.; and the diameter of the pipe is 6 ft. The remainder of the pipe follows a heavy grade and, due to the increasing hydrostatic head throughout its length, necessarily falls outside of the limits of wood-stave pipe and is of steel. To have constructed the long section of steel would have required a thickness of at least 5/16 in. and to lessen the danger of collapse, this would probably have been made 3/8 in. Such a steel pipe would have cost, laid, about $16.50 per ft. A carefully selected and built wood-stave pipe was installed with 3 in. staves and round galvanized steel bands 5/8 in. in diameter. The spacing at the intake end is 10 in. and at the lower end, where the head is greatest it is 2 in. This pipe cost laid, $1.56 per linear ft. It should have a life of at least 10 years. The lower first cost is a vital item in the construction of a new plant, and in this case, where depreciation could not be greater than 10 per cent per annum, and good service is practically assured, it is good engineering practice to figure on replacement at least twice rather than employ the more costly steel construction.

The argument which holds good for large pipes under low pressures is even more applicable to small service pipes in town or city water works systems, and many small towns are enjoying a perfect water supply service using the wood machine-made pipe that could scarcely afford the cost of the same system with cast iron mains.

PERSONALS.

Thomas Mirk and K. G. Dunn, of Hunt, Mirk & Co., are in Southern California.

S. M. Kennedy of the Los Angeles Edison Electric Company, was at San Francisco this week.

J. W. Boyle, who is interested in electric railways at Utica, N. Y., was a San Francisco visitor last week.

Leon Bly, the secretary of the Tehama County Water & Power Company, is at San Francisco from Red Bluff, Cal.

Ben H. Maddox, of the Mt. Whitney Power Company at Visalia, Cal., was at San Francisco during the past week.

J. J. Davis, superintendent of the Santa Monica Light and Power Company, of Los Angeles, was a recent San Francisco visitor.

Morris Bien, a supervising engineer in the reclamation service of the United States government, was a recent arrival at San Francisco.

J. P. Poindexter, manager of the gas and electric lighting system of the Pacific Gas & Electric Company at Marysville, was at San Francisco during the past week.

R. E. Starkweather is building by contract the transmission and telephone line of the Mt. Konocti Light & Power Company from Hopland to Lakeport, Cal.

Wynn H. Meredith, Pacific Coast manager for Sanderson & Porter of New York, has returned to his San Francisco office from British Columbia, after an Eastern trip.

R. L. Yates, chief engineer with the Platt Iron Works, spent the past week at San Francisco with Chas. C. Moore & Co., Pacific Coast representatives of his company.

H. C. Goldrick, Pacific Coast manager for the Kellogg Switchboard & Supply Company of Chicago, has just returned to San Francisco after a tour of Oregon and Washington.

J. W. White, of the sales force of the Fort Wayne Electric Works, returned to San Francisco last Tuesday from an extensive tour of California and Nevada mining districts.

George I. Kinney, manager of the Pacific Coast offices of the Fort Wayne Electric Works, has returned to his San Francisco office after a tour of Oregon and Washington.

B. C. Condit, engineer for the Fleishhacker interests, is at Portland, Ore., in connection with their new hydroelectric transmission project in that territory. They are now in the market for two 5000-kw. generators.

C. L. Cory recently completed a valuation and a report to the Mayor and City Council of Berkeley on the plant of the Berkeley Electric Lighting Company in connection with the fixing of future rates for lighting.

W. S. Hanbridge left last Thursday on a ten days' tour of Southern California in the interests of the coming convention of California State Association of Electrical Contractors at Santa Catalina Island. He will visit Santa Barbara, Bakersfield, Los Angeles and San Diego, and other cities.

W. T. Brown, formerly with the Washington Water Power Company at Spokane, in conjunction with W. L. Hoffman and F. H. Godfrey, has opened offices as consulting electrical and mechanical engineer at Seattle, Tacoma and Vancouver, the Seattle office being in the Bailey Building and the Tacoma office in the Bank of California Building.

F. D. Weber, electrical inspector of the Underwriters' Equitable Rating Bureau, has been elected chairman of the Portland (Ore.), Section of the American Institute of Electrical Engineers, and H. R. Wakeman, engineer line department of the Portland Railway, Light & Power Company, secretary. L. B. Cramer, W. M. Hamilton and C. L. Wernicke make up the executive committee.

W. G. B. Euler, power-house superintendent of the Great Western Power Company, with headquarters at the Las Plumas plant, was at San Francisco last Tuesday.

A. Strauch, formerly with the General Electric Company's San Francisco office, has taken a position at the head of the new business department of the Mt. Whitney Power Company at Visalia.

Newly-elected members of the American Institute of Electrical Engineers include: E. L. Bettanier, electrician, Pasadena Municipal Light Department, Pasadena, Cal.; W. R. Birt, electrician, telegraph department, Southern Pacific Co., San Francisco, Cal.; R. E. Cunningham, superintendent electrical distribution, Southern California Edison Co., Los Angeles, Cal.; B. C. Edgar, assistant engineer, Southern Pacific Co., San Francisco, Cal.; W. F. Forward, wireman and repairman, Northern California Power Co., Manton, Cal.; F. H. Goodwin, electrical machinist Southern Pacific Co., Oakland, Cal.; J. A. Groninger, assistant chief electrician, Atchison, Topeka & Santa Fe Railroad, San Bernardino, Cal.; C. E. Kemper, engineer, Pacific Tel. & Tel. Co., Los Angeles, Cal.; L. M. Klauber new business department, San Diego Gas & Electric Co., San Diego, Cal.; R. B. Lawton, operator in charge, hydraulic generating station, Pacific Light & Power Corporation, Azusa, Cal.; C. W. B. Lindsey, electrical operator, Pacific Light & Power Corporation, Los Angeles, Cal.; O. G. F. Markhus, general manager, Idaho-Oregon Light & Power Co., Boise, Idaho; D. H. McAllister, assistant general superintendent of operation, Telluride Power Co., Provo, Utah; H. C. McCutchan, sales engineer, Holabird-Reynolds Elec. Co., Los Angeles, Cal.; E. R. Pease, draftsman, Western Canada Power Co., Vancouver, B. C.; W. H. Trenner, superintendent, Idaho-Oregon Light & Power Co., Boise, Idaho; C. M. Warnecke, assistant electrical engineer, Pacific Electric Co., Los Angeles, Cal.; E. G. Wedgwood, electrician, Sacramento Valley Power Co., Chico, Cal.; G. W. Welsh, assistant engineer, electrical department, Southern Pacific Co., San Francisco, Cal.

TRADE NOTES.

M. C. Baker & Son have moved their electric shop from 61 Second street to more commodious quarters at 78 Second street, San Francisco.

The annual conference of Pacific Coast salesmen and supply agents of the General Electric Co. was held at San Francisco this week, several Eastern heads of departments attending.

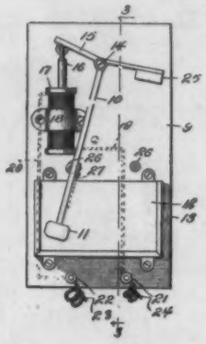
The Colonial Electrical Agency of San Francisco, agents for the Colonial Electric Company and the Economy Electric Company, incandescent lamp manufacturers, has removed from 576 Mission street, to the Board of Public Trade Building, 444 Market street.

O. K Brown, secretary of the Treasure Gold Mining Company, Pacific Building, San Francisco, has shipped a quantity of electrical equipment, purchased from Fairbanks, Morse & Co, to their mine and works at Hornitos, Cal. Current will be purchased from the San Joaquin Light and Power Corporation. A 15-h.p. motor will be installed to operate five additional stamps in the mill, a 40-h.p. motor to drive an air-compressor and a 6-h.p. motor for the concentrator.

The General Electric Company has closed a contract with the United States Government for three steam turbines for the Bureau of Yards and Docks for use in connection with the government drydock at Pearl Harbor, Hawaiian Islands. This aparatus is rated as follows: One A. T. B. 2, 1000-kw., 3000 r.p.m., 2300-v., horizontal Curtis turbine; one A. T. B. 2, 500-kw., 3600 r.p.m., 2300-v., horizontal Curtis turbine; one C. C. 2, 35-kw., 3600 r.p.m., 125-v., D. C. turbine exciter set.

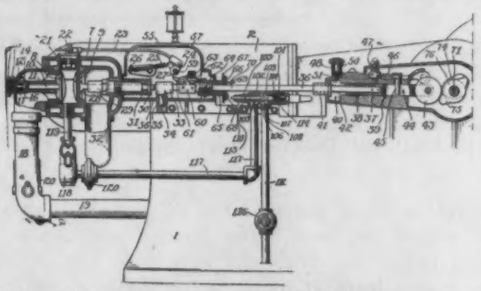
PATENTS

994,712. Electrical Indicator. Edward W. Bishop, Bakersfield, Cal. In an indicating device of the class described, the combination of a support, a swinging element mounted thereon, a position-indicating means located behind the free end of the element and over which the latter moves, an electrical device responsive to current for moving the element



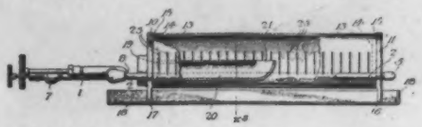
from its normal position, means for opposing the movement of the element and returning the latter to normal position when the said device is de-energized, a trough disposed behind the said position indicating means, and a member rigid on the element and extending into the trough for retarding the movement of the element.

995,062. Gas-Engine. Otho C. Duryea and Morris C. White, Los Angeles, Cal., assignors to Duryea-White Machinery Company, Los Angeles, Cal. A cylinder, a piston therein, a shaft, mechanism co-operating with the piston for driving



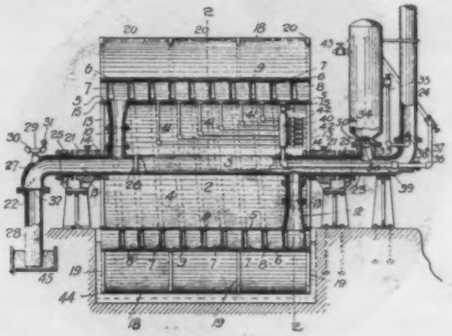
said shaft, valves, cams and a longitudinally and pivotally movable bar operated by said shaft for controlling said vales and thereby causing the piston to operate by internal combustion in said cylinder or by fluid pressure.

995,362. Oil-Gas Generator and Burner. Ezra P. Magoon, Los Angeles, Cal., assignor to Blue Flame Distillate Burner Company, Los Angeles, Cal. An oil burner comprising a generator formed with two horizontal members, a cross tube connecting said members at one end, an oil inlet connection at the other end of one of said members, an outlet connection at the corresponding end of the other of said members, a burner chamber, extending longitudinally



between said horizontal members, consisting of a tubular body with a series of vertical outlet openings in each side, end plates for said tubular body, the forward end plate being perforated and having a hollow extension projecting laterally into said tubular body forming a mixing chamber, the walls of said perforation converging rearwardly into said mixing chamber forming an air and gas inlet into said mixing chamber, said mixing having a discharge outlet in the top thereof at its inner end.

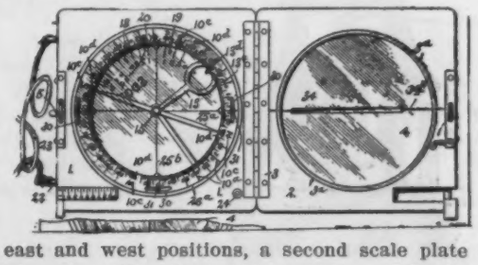
995,112. Water-Lift and Air-Compressor. Ransom Y. Bovee, Denver, Colo., assignor to Hydro Engine, Power & Irrigation Company, Denver, Colo. A device of the class named comprising a helicoidal conduit rotative about a horizontal axis, a suction pipe communicating with one of its ends, a stand-pipe communicating with the opposite end of



the conduit, an air reservoir having an inlet interposed between the conduit and the stand pipe, whereby the air leaving the conduit with the fluid, may be separated therefrom before the latter reaches the stand pipe, and valve controlled pipes respectively connecting the various convolutions comprised in said conduit, with said reservoir.

994,957. Magnetic Vibrator. Frank V. Smith, Floriston, Cal. In a device of the class described, an electro-magnet; plates applied to opposite ends of the magnet; a cover resting upon one of said plates; securing devices uniting the plates and the cover; a holder reciprocating in the plates and in the cover; an armature upon the holder beneath the cover; a spring bearing at one end upon the cover; and a device upon the holder for engaging the other end of the spring to adjust the tension thereof.

994,901. Surveying and Cruising Instrument. Joseph Barrow, Portland, Ore. A surveying instrument that comprises a compass box, a compass needle mounted in said box, a scale plate co-operating with said compass needle and having the cardinal points provided with indicating letters "N"—"S"—"E" and "W", said scale plate having pointers graduated on the same at the north, south, east and west letters to accentuate the indication of the north,



south, east and west positions, a second scale plate carried by said box beneath said compass needle and having graduated on the same a due north and south and a due east and west line, a lid hinged to said box, a mirror carried by said lid to reflect said compass needle and said scales when said lid is tilted up at an angle to the plane of said box, said lid having a line thereon according to the north and south line of said second scale plate.

INDUSTRIAL

SINGLE-PHASE AND POLYPHASE POWER-FACTOR METERS.

The modern tendency in the operation of large systems is to regulate the power-factor of the load by over-exciting synchronous machines, and wherever such regulation is attempted accurate knowledge of the value of the power-factor is highly desirable.

Fig. 1. Power Factor Meter.

One type of power-factor meter is based on the electro-dynamometer principle. It consists of a fixed field coil and two movable coils mounted in space quadrature on the same staff. The fixed or field coil is connected in series with the line and the movable coils are connected in shunt therewith. When used on polyphase circuits each coil is connected to a separate phase while used on single-phase circuits a phase-splitting device is employed.

When the current in one of the movable coils is in phase with that in the fixed coil, the movable system will turn until the fields due to these currents coincide. If the field due to the current in the fixed coil reaches its maximum at a time intermediate between the time of maximum of the currents in either of the movable coils, then the movable system takes up a position such that the resultant field of the two coils, which coincides in time-phase with the fixed field will also coincide in space position with it.

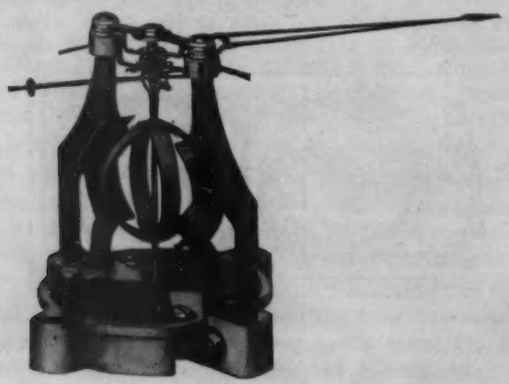


Fig. 2. Power Factor Meter Movement.

The accuracy and general usefulness of a power-factor meter of this type depend first of all upon the construction of the movable coils. If these coils are to perform properly their functions they must be of identical shape and size and they must be rigidly maintained in planes which bisect each other at right angles; that is, the coils must cross at right angles and pass bodily through each other. These seemingly impossible conditions have been met for the first time in a new form of power-factor meter recently placed on the market by the Weston Electrical Instrument Company of Newark, N. J. In this new instrument the coils are wound simultaneously on a special machine. They are interlaced layer by layer at diametral crossing points and an opening is left through which the staff may pass. The complete coils, which now resemble the famous Siamese twins, are treated with a special cement that binds the turns together like a single piece of metal, and thin tiny curved plates drilled to fit the staff are cemented over the inside surface of the

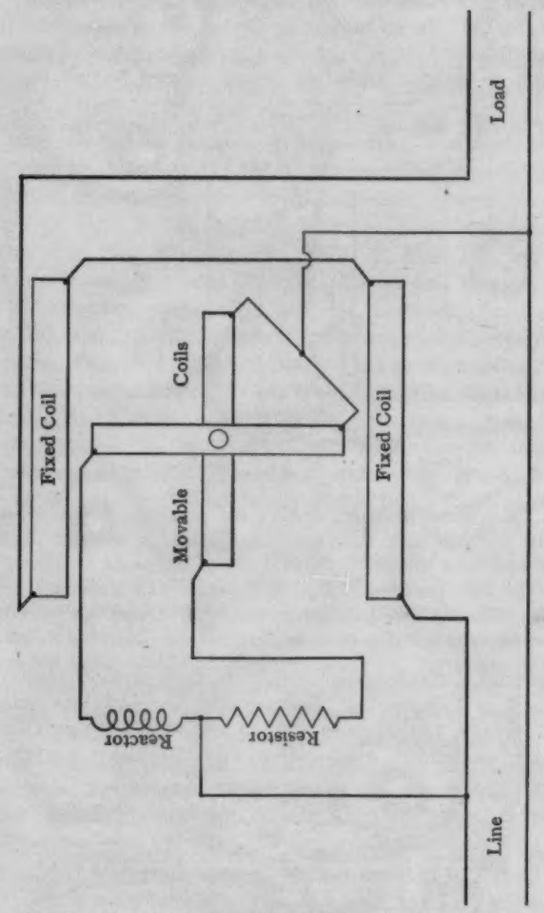


Fig. 3. Circuit Diagram Single Phase Power Factor Meter.

Fig. 4. Reactor.

Fig. 5. Auxiliary Box.

crossing points. These plates serve to center accurately the coil system and tiny pins which pass through the staff and engage ears on the plates hold it in a definite axial position.

Therefore the movable coils occupy a perfectly definite and permanent position with reference to each other and to the rest of the system such as is necessary to the production of a high degree of accuracy and reliability.

The electrodynamometer type of power-factor meter offers a serious difficulty in that the movable system must be electrically connected to the external circuit and yet this connection dare not offer any appreciable torsional effect to oppose the motion of the system. The spirals used in this new power-factor meter are extremely delicate affairs; they are just strong enough to be self-sustaining and yet not exert any appreciable torque. For instance, 16,000 of these tiny spirals weigh only 1 ounce and the error due to their torsional moment is only 1 per cent at 1/5 load.

When used on single-phase circuits a phase-splitting device is required and the reactor has to be specially designed for this class of work if anything like accurate results are to be expected. The reactor used with the single-phase power-factor meter is shown in Fig. 4 and is similar in its mechanical construction to those used with the frequency meter which were described in a previous issue. This power-factor meter has the distinction of being the first instrument of this type, which can be used on single-phase circuits without sacrifice of accuracy.

STOCKTON FIRE ENAMEL BRICK PLANT.

The plant of the Stockton Fire Enamel Brick Company, which makes a specialty of glazed and malt glazed bricks, is situated on the outskirts of Stockton on the Southern Pacific and Western Pacific Railroads. Two spur tracks about 1000 feet long, run from the Southern Pacific line to the works, the raw material being brought in on one track, and the finished product sent out on the other.

The clay, which is the finest obtainable in California, is brought from Lincoln, Placer county, about 70 miles distant. It is dumped from the cars and then shoveled into a dry pan, belt driven by a 35 h.p. motor of the squirrel cage type, where the clay is ground up fine and then drops through a screen in the bottom of the dry pan and is caught up by a cup elevator driven by a 5 h.p. General Electric induction motor and carried to top of building and dropped onto a screen, through which it passes into a number of bins placed about 20 feet below. From these bins the ground clay is conducted through a pipe to the pug mill, where it is mixed with water and sand in such proportions as to give it the right consistency. The pug mill is driven by a 25 h.p. induction motor. From the pug mill the mixture passes by gravity down a chute into the brick machine on the ground floor. A 75 h.p. induction motor drives the brick machine. The compressed clay is conveyed from the brick machine by a belt to an automatic cutting table where the clay is cut to the requisite size for bricks. These bricks are then conveyed to another department where they are dipped in the glazing solution, and then either taken to a drying room, or allowed to dry in the sun. After being dried they are again dipped in the glazing solution, after which they are taken to the kiln to be burned. The bricks are then ready for shipment.

It is interesting to note that the bricks require only one burning, unlike otner factories on the Coast, which have to give two burnings. The special glazing which this company uses, makes it necessary to burn the bricks but once. Each of the four kilns has a capacity of 60,000 bricks, and is heated by means of oil to a maximum temperature of about 2000 degrees F.

Power is taken from the Pacific Gas & Electric Co., at 2000 volts, 3-phase, 60 cycles, and transformed down to 3-phase, 440 volts by means of three 20 kw. oil cooled transformers. These transformers take care of the average load (60 h.p.) easily, and if the maximum horsepower capacity of the plant (150 h.p.) is used—which occurs very rarely—the transformers must carry an overload.

The plant has been in operation for six years, and during that time the only repairs to the motors have been the replacement of new bearings and a few minor adjustments. All of the electrical machinery is of General Electric manufacture, and the brick and clay machinery was made by the American Clay Machinery Company. The installation of the electrical apparatus was made by the Electrical Engineering & Supply Company, Stockton, Cal.

COLUMBIA AND PUGET SOUND RAILROAD ADOPTS THE TELEPHONE.

The Columbia and Puget Sound has joined the ranks of the railroads which favor the telephone method of dispatching trains, and has ordered from the Western Electric Company at Seattle selectors and associated telephone apparatus for a circuit about thirty miles in length.

The dispatcher for this line will be located at Seattle. Way station telephone equipments will be installed at Indian, Argo, Black River, Maple Valley and Renton. The line will be constructed of No. 10 gauge hard drawn copper wire.

The railway telephone has gained a strong foothold in the northwest, where it is replacing the long-established telegraph for handling train movements on a large number of the more important roads, including the Canadian Pacific, Chicago, Milwaukee & Puget Sound, Great Northern, Northern Pacific, Oregon Short Line and the Spokane, Portland & Seattle.

ELECTRIC POWER INSTALLATION OF THE SANTA ROSA MINING COMPANY.

The Santa Rosa Mining Company, a subsidiary of the Exploration Company of England and Mexico, located in the State of Zacetecas, Mexico, near Concepcion del Oro, has received and is erecting most of the machinery that will enter into the equipment of its mill.

Electric light and power is supplied to the property from a gas producer plant in which anthracite coal or charcoal is used as fuel. The gas engine will be connected by a belt to a 150 kw. Westinghouse a.c. generator. Switchboards, transformers, etc., and 20 motors have been installed. The entire equipment is very complete. The tube mill is driven by a 60 h.p. motor; there are seven motor-driven direct connected pumps for supplying water to the cyanide plant, and nine other motors are located at various places around the plant.

A transmission line about two miles long supplies the current to three motor-driven pumps, which control the water supply.

All of the equipment has been purchased from the Cia. Ingeniera, Importadora y Contratista, S. A., of Mexico City, which has furnished Westinghouse equipment throughout. The motors are of a new type which the Westinghouse Company has brought out for especially heavy duty service. When completed, this property will have one of the most modern equipments in Mexico.

NEW CATALOGUES.

Catalogue No. 50 from the Brookfield Glass Company effectively portrays and describes their complete line of screw glass insulators and knobs for all purposes.

Economical Steam Production presents the principles of soot cleaning as applied to all types of water tube and return tubular boilers by means of the Vulcan soot cleaner, sold by G. L. Simonds & Co., 801 Steinway Building, Chicago, Ill.

NEWS NOTES

FINANCIAL.

NORTH YAKIMA, WASH.—North Yakima proposes to construct a municipal power plant to cost $250,000. This is to be financed by sale of fifty-year bonds.

CONNELL, WASH.—Four million dollars will be expended by the Washington Water Power Company of Spokane in building its electric power plant at Long Lake, 23 miles north of the city.

SUMAS, WASH.—An ordinance of the town of Sumas providing for the establishment and maintenance of an electric lighting, heating and power system, has been passed. Bonds to the amount of $7000 will be issued.

OAKLAND, CAL.—The growth of business on the lines of the Oakland Traction Company is shown by the following comparative statement of gross earnings: 1902, $945,000; 1905, $1,441,000; 1906, $2,218,000; 1907, $2,515,000; 1908, $2,771,000; 1910, $2,934,000.

SANTA BARBARA, CAL.—The City Council has awarded $40,000 worth of 4 per cent city water tunnel bonds to the Santa Barbara County National Bank at accrued interest and a premium of $233.50. Other bids were: Santa Barbara Savings and Loan Bank, $203; William R. Statts of Pasadena, $56, and E. G. Blymer of San Francisco, $12.50.

TENINO, WASH.—The entire holdings and franchise of the Tenino Light & Power Company have been purchased by the Washington-Oregon Corporation, which is reported to be a subsidiary corporation of the O. R. & N. Co. The purchasing company will at once construct a power plant on the Skookumchuck river to furnish electricity to the Hercules Sandstone Company.

PORTLAND, ORE.—The results of operations of the Portland (Ore.) Railway, Light & Power Company in 1909 and 1910 follow:

	1909	1910
Gross receipts	$4,818,022	$5,638,895
Operating expenses	2,196,496	2,444,178
Net earnings	$2,621,526	$3,194,717
Fixed charges	1,493,039	1,678,228
Surplus	$1,128,487	$1,516,489
Per cent of operating expenses	45.6	43.3

B. S. Josselyn, the president, says that the increase in gross earnings in 1910 over 1909 was $820,873, or 17 per cent. The increase in net earnings was $573,191, or 21.9 per cent. Thirteen and one-half miles of single track were constructed and 22½ miles reconstructed, the reconstruction being caused mainly by the paving of streets occupied by tracks. The total cost of track construction and reconstruction was $1,006,710, of which $785,069 was charged to capital account. There are 250.93 miles of single track in the system. Eighty-two new passenger cars, thirty-four freight and work cars were purchased, and six passenger cars, one mail and express car and three locomotives were built in the company's shops, at a total cost of $642,663. The present equipment consists of 568 passenger cars, 352 freight and work cars and eight electric locomotives. Three car barns with storage capacity for 115 cars were completed. The nine-story office building in Portland was completed.

SAN FRANCISCO, CAL.—The United Railroads Company and its holding company, the United Railroads Investment Company, of New Jersey, have issued annual reports for the year 1910. The report of the latter corporation shows that it holds all of the $5,000,000 of first preferred stock of the local street railway combine, all of its $20,000,000 of preferred stock, $8,801,400 of its $20,000,000 of common stock and guarantees its outstanding $400,000 of equipment notes. The latter and the first-preferred stock were issued by the United Railroads Company after the disaster of 1906. The local street railway combine earned a surplus of $601,907 last year, as against $404,470 in 1909. For the year 1910 its gross earnings amounted to $7,653,489; net earnings, $2,924,219; other income, $90,279. Fixed charges were $2,412,509. Gross earnings were $197,524 greater than in 1909, while the surplus increased $197,437 over the preceding year. The New Jersey holding company, in addition to owning United Railroads Company stocks, owns most of the stock of the Philadelphia company of Pittsburg, which has street railway and gas and electric properties in that city and several towns close by. The holding company had a surplus of $766,467 in 1910, against $512,350 the year before. Its receipts in 1910 were $2,044,672 from dividends on stocks and $64,889 of other income. Its expenses amounted to $75,124, and it paid $1,268,070 as interest on bonds.

INCORPORATIONS.

OXNARD, CAL.—Herbert Hedges and S. S. Bradley will open an electrical supply business at 105 Fifth street, under the title of Hedges-Bradley Electrical Company.

EUREKA, MONT.—The Tobacco Valley Telephone Company has been organized to furnish service to Gateway, Rexford, Fortine and Trego. P. N. Benard is president.

BOISE, IDAHO.—Articles have been filed for the Boise-Council-Landore Railroad. Preliminary surveys have already been made for this line, which is to be an electric road from Council through the rich fruit belt of Adams county. The incorporators are: John M. Haines of the Pierce real estate firm, E. W. Bowman, J. D. S. Manville, Harry Wyman and Geo. Huebener. The capital stock is $2,000,000.

OAKLAND, CAL.—Articles of incorporation of the Oakland Natural Gas Company have been filed with the county clerk. The company is capitalized at $300,000, with shares at $1 each. The directors are: C. W. Porter, S. L. Klarnet, J. E. Cofer, T. T. McMahon and N. B. Myran. It was announced by Porter, who is president, that C. L. Cofer of Red Bluff has located natural gas sources within the city limits of Oakland.

ILLUMINATION.

ELKO, NEV.—The Board of Commissioners has granted the Deeth Mercantile Company a franchise to light the town of Deeth with electricity.

MOUNTAIN HOME, IDAHO.—The Council has granted to L. L. Nunn & Co. the right to enter the city with a line for furnishing light and power.

FRESNO, CAL.—According to a statement by Manager A. G. Wishon of the San Joaquin Light and Power Company, the price of electric lights in all the larger cities and towns from Merced on the north to Bakersfield on the south, and including Fresno, will be 8 cents per kilowatt-hour after November 1 next.

SAN DIEGO, CAL.—The San Diego Consolidated Electric Company is soliciting subscribers in National City and Chula Vista and will soon have gas piped in the district for lighting and cooking.

MARYSVILLE, CAL.—The supervisors have granted Hetz & Berg, electricians of Marysville, permission to erect poles and string wires for an electric lighting system in Live Oak and adjacent highways.

WILLOWS, CAL.—The gas plant will be in operation in a few days. Van E. Britton, the Northern California Power Company engineer in charge of the construction of the plant here, says gas will be ready for consumption this week.

SUSANVILLE, CAL.—James Branham made application to the Board of Trustees for a franchise for a period of 50 years, to erect and maintain poles and wires for the transmission of electricity for heat, power and lighting along the streets and alleys of Susanville.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Company has contracted with the National Briquetting & Clay Working Machinery Company to repair a compound Corliss gas compressor at the gas works at the corner of Center and Ducommon streets for $3000.

NEWPORT, CAL.—Morris Wygant has received notice from the General Land Office, Washington, that he has been awarded the contract for a survey of a hydroelectric power site and canal at the Siletz Agency. The estimated cost of the proposed plant is $250,000.

SAN LUIS OBISPO, CAL.—R. E. Easton has made application to the Board of Supervisors of the county of San Luis Obispo, for a franchise for a period of 50 years, to furnish the inhabitants of the county, with natural and artificial gas for lights, heat, fuel and power.

LOS ANGELES, CAL.—The Supervisors have granted to the Southern California Gas Corporation a 40-year gas franchise, covering the greater portion of the county. The price paid was $100. The franchise covers a territory running east of the city to Pomona and west to a line even with Redondo Beach.

TRANSMISSION.

NORTH YAKIMA, WASH.—This place will decide July 1 on a $300,000 bond issue for construction of a municipal power plant.

HERMISTON, ORE.—The Hermiston Light & Power Company will erect a concrete dam to replace the temporary one now in use.

AUBURN, CAL.—The Supervisors have granted a franchise to the Great Western Power Company to erect a pole line along the highways of Placer County.

DAYTON, WASH.—The Pacific Power & Light Company has been granted a 50-year franchise for the construction of a power line along the old Lewiston road.

OAKLAND, ORE.—This place recently voted $15,000 in bonds with which to establish a light and power plant and to cancel the floating indebtedness of the city.

BAKERSFIELD, CAL.—The San Joaquin Light & Power Company has made application to the Board of Supervisors for a franchise to erect poles and wires for the transmission of light and power on all public highways in the county for a term of fifty years.

YREKA, CAL.—Preliminary work for the construction of the dam across the Klamath river by the Siskiyou Electric Power & Light Company has been commenced. The dam is about seven miles down the river from Klamath Hot Springs. A large power plant will be built near the dam for the generation of electricity.

MARE ISLAND NAVY YARD, CAL.—Bids will be received at the bureau of yards and docks, navy department, up to July 8 for auxiliary power plant equipment at this yard.

WALLA WALLA, WASH.—Franchise has been granted the Pacific Power & Light Company for a transmission line from this place to Columbia county line. Construction work will begin at once.

EUGENE, ORE.—The Oregon Power Company is completing its transmission line from the Albany substation to Brownsville, Oregon. J. L. Lambirth, of Eugene, is superintendent of construction.

GUSTINE, CAL.—The Pacific Gas & Electric Company has withdrawn from this field, and the San Joaquin Light & Power Company announces that this company's line will be extended to Gustine. J. A. Berryman is representing the latter company.

TRANSPORTATION.

OLYMPIA, WASH.—Dr. F. H Carlyon has been granted a franchise by the City Council for the construction of a belt line railway around tne Carlyon fill on the waterfront.

SANTA MONICA, CAL.—The City Clerk will receive sealed bids up to July 10 for the purchase of a franchise to operate for a period of 40 years a street railway in this place.

BURLEY, IDAHO.—Reports are to the effect that Chicago capitalists have disposed of bonds for the construction of an electric railway from Burley to Albion, and that the owners will soon arrive here to start construction work.

LOS ANGELES, CAL.—Final surveys are being made and material assembled for the electric railway to be built between Los Angeles and Redondo for the Moneta avenue line and for the Long Beach line of the Pacific Electric Railway Company.

SANTA CLARA, CAL.—The Peninsular Railroad Company has applied for a franchise for a single or double track electric railroad on Saratoga avenue, Bellomy street, Lincoln street, Franklin street and Jefferson street to connect with the present electric railroad here.

LOS ANGELES, CAL.—The request of the Los Angeles-Pacific Railway Company for permission to electrify the old Santa Monica steam line of the Southern Pacific Company from Clemente Junction to the west city limits, has been referred t. the Board of Public Utilities.

CHICO, CAL.—The Northern Electric Railway has been granted a 50-year franchise for a double-track on Main street and will surrender its present franchise known as the "Clough franchise." Officials of the company state that the work of laying the double track will begin within a few days.

FRESNO, CAL.—The graders who are at work on the Fresno, Hanford & Summit Lake road are at last headed toward Fresno. The ordinance granting a franchise to the road through Fowler passed its final reading this week and gave to the road a franchise along one street through the town.

OAKLAND, CAL.—Plans for improvements that will double the capacity of the Key Route lines through Oakland and Berkeley are nearly completed. In addition to converting the Key Route pier into a solid mole it is proposed to enlarge the ferry depot and slips at the end of the mole and to carry all trains through the depot on a series of loops. The loop is to be constructed on a solid foundation of earth and concrete, instead of upon piling. The loop system, it is claimed, will greatly facilitate the handling of passengers, and will shorten the running time of trains.

OAKLAND, CAL.—The City Council has passed an ordinance granting to the Oakland and Bay Shore Railroad Company a franchise for the period of 35 years, to construct and maintain railroad tracks of standard gauge together with all necessary switches and crossings in certain parts of the city of Oakland.

SAN FRANCISCO, CAL.—Ernest Thalmann, the New York banker; Patrick Calhoun and their associates have just completed arrangements for the sale of $1,000,000 of the bonds of the Sierra and San Francisco Power Company, to complete its electric generating plant on the Stanislaus River, together with its distributing system.

LOS ANGELES, CAL.—The Pacific Electric Railway Company has contracted with Chas. W. Corbaly to construct and complete a single track pile trestle bridge over Verdugo Wash., on the railway line known as the Glendale-Burbank line at $0.435 per lin. ft. for placing pile in trestle below cut off, and $35.75 per 1000 ft. board measure for lumber.

LOS ANGELES, CAL.—About $550,000 is being expended by the Pacific Electric Company for the immediate improvement of its service. The company will place about 85 additional cars in operation in July and has just purchased motor generator sets for substations at Pasadena, Redondo, Del Rey, Vineyards and other points. The cost of equipment will be about $150,000.

TELEPHONE AND TELEGRAPH.

WALLACE, IDAHO.—The North Idaho Telephone Company announces that work will commence at once on construction of a line for the completion of circuit between Murray and Nelson siding.

SAN FRANCISCO, CAL.—The telephone rates bill has been passed to print by the unanimous vote of the Supervisors. It makes no change in the charges to the public, but reduces slightly the expense to hotels of wall phone extensions in the private rooms.

LOS ANGELES, CAL.—The Board of Public Utilities have fixed the phone rates and have increased the residence charge on the Home Company's phones to $2.50 and reduced the Pacific Company's charges for residence phones to $2.50. Business service has been reduced from $6 to $5.75. It is expected that these rates will stand.

WATERWORKS.

SEWARD, ALASKA.—The City Council at Prince Rupert is planning to build waterworks and sewers to cost $600,000.

SAN LUIS OBISPO, CAL.—Sealed bids are being received by the Clerk of the Board of Trustees for furnishing water pipe and fittings in accordance with specifications.

COEUR d ALENE, IDAHO.—The County Commissioners have granted to the Bayview Townsite and Water Company the right to establish waterworks and system in this county.

ALTURAS, CAL.—The town of Alturas has advertised for bids for sinking and casing two wells each ten inches in diameter, as part of the public water system to be installed here.

SAN DIEGO, CAL.—A centrifugal pump, which lifts 10,000 gallons a minute will be installed at the end of the 10 inch main at La Jolla to relieve a threatened water famine there.

LOS ANGELES, CAL.—The Board of Public Works will receive sealed bids up to June 30, for furnishing three 14 inch gate valves, six 16 inch gate valves, nine 18 inch gate valves, two 24 inch gate valves and five 26 inch gate valves to the city.

HELENA, MONT.—An election is to be held here on the 26th of June for the purpose of submitting to taxpayers the question of issuing $400,000 bonds for the purpose of acquiring a water plant.

LEWISTON, IDAHO.—The City Council has authorized the city comptroller to issue a call for bids for supplying the city with 1275 ft. of 4-in. pipe to be used in extending the water system service.

LOS ANGELES, CAL.—The Board of Public Service Commissioners will receive sealed bids up to June 13 for furnishing cast iron water pipe and fittings to the Department of Public Service of the city.

SACRAMENTO, CAL.—Bids will be received at the office of the clerk of the trustees, up to July 19th, 1911, for 30 dozen three-quarter inch water taps for the water department. The taps must weigh finished 42 ounces.

SAN LUIS OBISPO, CAL.—The bids of contractors Payne & Deacon for the construction of the new water pipe line, the building of the concrete dam and the sand box have been rejected by the city council and the work has been ordered done by the Department of Public Works.

SEATTLE, WASH.—The Council has passed an ordinance providing for the improvement of a portion of Twenty-sixth avenue Northwest and Twenty-seventh avenue Northwest, by the construction of water mains according to plans filed in the office of the Department of Public Works.

PORTERVILLE, CAL.—Plans and specifications have been drawn up by the city engineer for the extension of the mains of the water system. It is estimated that the work of completing the system will cost in the neighborhood of $50,000, making almost $200,000 which has been spent by the city since the municipal ownership of the plant was completed.

DUNSMUIR, CAL.—The Dunsmuir Water, Power & Light Company will begin work improving the system before the end of the month. A new 12 inch pipe will be laid from Mossbrae Falls to Dunsmuir. This will cost $75,000. The pipe will be 18 inches in diameter at the falls and in the course of a mile will taper to 12 inches. A force of from 75 to 100 men will be employed.

ELMA, WASH.—The bid of the Algrace Company of Seattle, for $10,000 of Elma water bonds has been accepted by the council, which has decided to lay an 8-in. wood pipe from the Wenzell springs to 5th street, a 10-in. iron pipe from that point through Main and Third streets to the railway track and a 2-in. wood pipe from that point to the reservoir. Mr. L. Louis Kelsey of Portland is the engineer in charge of the water works.

SANTA FE, N. M.—Adjutant General S. S. Brooks has awarded contracts to supply a water system for the target range at Las Vegas where the National Guard will hold its encampment this summer and which is three miles from any water. A contract for a 15,000 gallon steel tank was awarded to the Des Moines Brick and Iron Company of Des Moines, Iowa. The contract for the pump and motor house and for laying pipe was given to F. J. Gehring of Las Vegas.

OAKLAND, CAL.—The Sierra-Blue Lakes Water Company, of which Eugene Sullivan of San Francisco is president, is awaiting the decision of the new commission relative to the proposed acquirement of a municipal plant. The company has made an offer in the form of a letter to Councilman Wm. J. Baccus. A supply of 60,000,000 gallons a day is promised for an expenditure of $20,000,000. The plan includes a watershed in Calaveras, Alpine and Amador counties of 534 square miles, a reservoir of a capacity of fifty billion gallons and conditions available for an electric power plant which, it is claimed, will produce 50,000 h.p. without extra cost. The same offer has been made to Berkeley.

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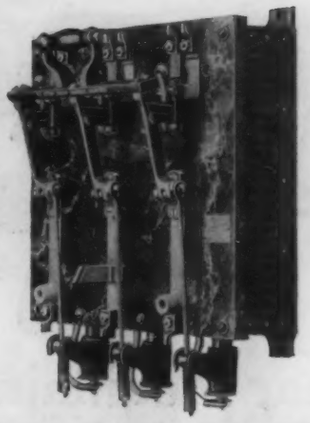

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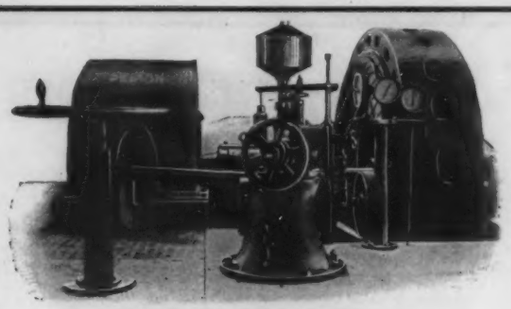

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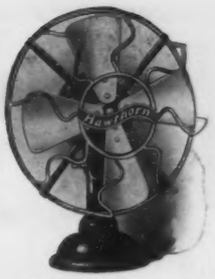

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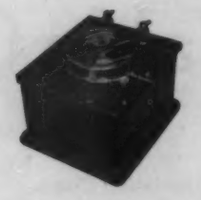

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††Alta	200
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Amador	200
Antioch	3,000
††Auburn	2,050
Barber	200
**Belmont	600
Belvedera	350
Benicia	2,500
**Berkeley	42,000
Big Oak Flat	150
Biggs	750
Black Diamond	500
Brentwood	200
Brighton	100
Broderick	500
‡Brown's Valley	50
**Burlingame	5,000
Byron	200
Campbell	1,000
Cement	1,500
‡Centerville	20
Centerville	500
**Chico	13,000
**Colusa	2,700
‡Colfax	400
Colma	500
Concord	1,500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Davenport	1,000
Davis	750
Decoto	350
Dixon	1,000
Dobbins	50
Drytown	100
Durham	500
‡Dutch Flat	400
**Easton	500
**East San Jose	1,500
Eckley	20
Emerald	50
Elmhurst	2,500
Elmira	150
El Verano	100
**Emeryville	2,000
Encinal	20
Fairfield	300
**Fair Oaks	250
Fitchburg	250
Folsom	1,500
*Fresno	35,000
Glenn Ellen	500
Gold Run	100
Grafton	350
†Grass Valley	7,000
Gridley	1,800
Groveland	50
Hammonton	500
Hayward	4,000
Hollister	3,000
Ione	900
Irvington	1,000
Jackson	2,000
Jackson Gate	50
Larkspur	950
Lawrence	100
Kennedy Flat	50
Kentfield	200
‡Lincoln	1,500
‡Live Oak	200
Livermore	2,250
‡Loomis	150
Los Altos	200
Los Gatos	3,000
Mare Island	500
Martell	25
Martinez	5,000
**Marysville	6,250
Mayfield	1,500
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Mill Valley	4,500
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†Nevada City	4,000
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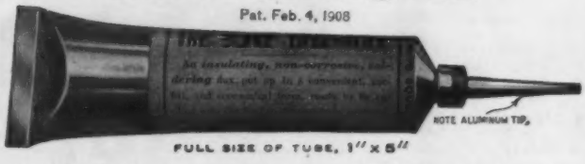

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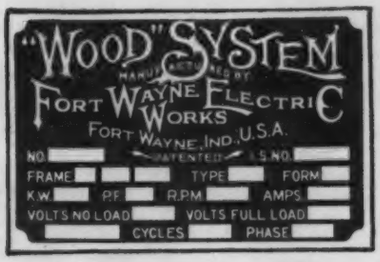

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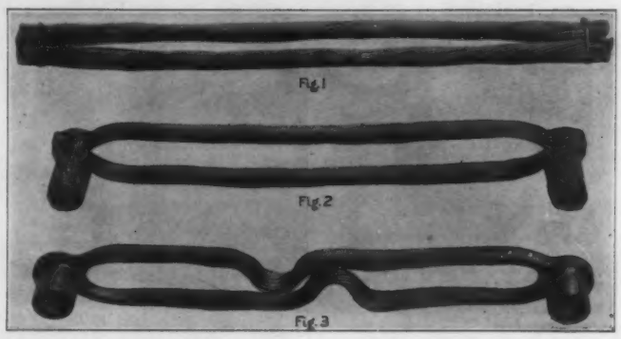

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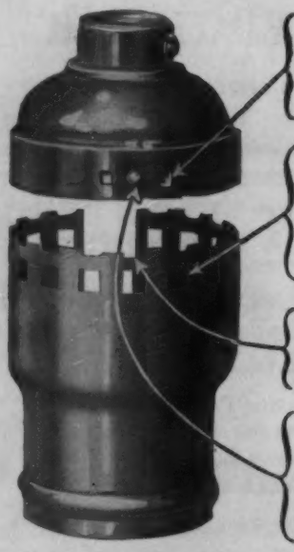

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